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PHYSICS ABSTRACTS

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SCIENCE ABSTRACTS—SECTION A

EDITED AND ISSUED MONTHLY BY
THE INSTITUTION OF ELECTRICAL ENGINEERS
IN ASSOCIATION WITH
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THE AMERICAN PHYSICAL SOCIETY
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ABSTRACTS 1–318

Vol. 47 JANUARY, 1944 No. 553

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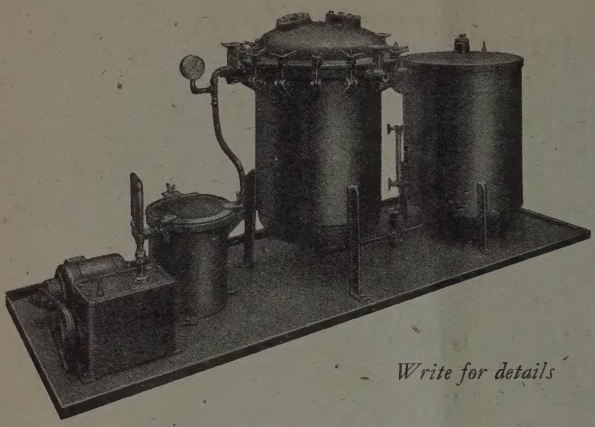

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159.1 : 612.8 1

Studies in the mathematical biophysics of discrimination and conditioning. III. LANDAHL, H. D. *Bull. Math. Biophys.*, 5, *pp.* 103–110, *Sept.*, 1943.—The theory dealing with recognition learning is generalized to include 5 variables: the errors, trials, possible number of choices, the number of items and the fraction of prompting. The theory is extended to include recall learning. This extension necessitates the introduction of a variable which is the number of trials without responses, i.e. the third category of judgment. The strengths of reward and punishment are introduced as variables. Thus a curve in 9 dimensions is determined.

511.31 : 517.522.6 2

On arithmetic functions. MENON, P. K. *Proc. Indian Acad. Sci. A*, 18, *pp.* 88–99, *Aug.*, 1943.—The paper deals with an operation which generalizes composition and compounding, and evaluates certain multiple Dirichlet series and Lambert series.

512 : 519.5 : 530.1 3

The new algebras and their significance for physics and philosophy. WHITTAKER, E. T. *Repr. Year Book Roy. Soc. Edinb.*, 1944, [19 *pp*], 1943.—Reviews the development from the invention of quaternions. Boole and others developed symbolic logic, and symbolism both resolved some existing difficulties and made possible considerable progress. Reaction on mathematics itself led to the attempt to express the fundamentals of mathematics entirely in terms of logical concepts. The mathematical physicist is led to non-commutative algebras by different considerations; the expression of fundamental entities as aggregates of states leads to matrix algebra. W. G. B.

512.831 4

On the matrix representation of complex symbols. RUTHERFORD, D. E. *Proc. Roy. Soc. Edinb. A*, 62, 1, *pp.* 25–27, 1943.

512.831 : 530.145.63 *see Abstr.* 80

512.831 : 548.1 *see Abstr.* 315

512.896 5

On the number of terms in a simple algebraic form under the symplectic group. LITTLEWOOD, D. E. *Proc. Camb. Phil. Soc.*, 39, *pp.* 197–199, *Oct.*, 1943.—[See Abstr. 3 (1943)].

513.515.6 : 531.224.5 : 744.345.3 6

An elliptograph: with supplement on the evolute of the ellipse and the elastica. BOYS, C. V. *Proc. Phys. Soc., Lond.*, 55, *pp.* 471–481, *Nov.*, 1943.—An instrument is described which enables a close approximation to a semi-ellipse with given axes to be drawn. The principle rests on the close similarity between the evolute of the ellipse and a certain elastica. W. G. B.

513.596.9 7

The focal form of the quadric in n dimensions. GREEN, H. G. *Proc. Camb. Phil. Soc.*, 39, *pp.* 159–167, *Oct.*, 1943.—Shows that the equation of the quadric in n dimensions can be transformed to a "focus-directrix" form which is exactly similar to those for 2 and 3 dimensions: this form is extended throughout by the introduction of a constant k. A short discussion of confocal quadrics is appended.

513.636 8

Some manifolds generated by normal rational curves. JONES, R. R. *Proc. Camb. Phil. Soc.*, 39, *pp.* 153–159, *Oct.*, 1943.

513.738.1 9

Dynamical trajectories in a resisting medium. KASNER, E. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 263–268, *Sept.*, 1943.—The motion of a particle moving in the plane under a positional field of force and influenced by a resisting medium, the resistance acting in the direction of the motion and varying as some function of the speed v is considered.

513.738.3 10

Dynamical trajectories of the curvature type. CICCO, J. DE. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 268–270, *Sept.*, 1943.—The problem is discussed in 3-dimensional space.

513.761.2 11

Union-preserving transformations of differential-elements. KASNER, E., AND CICCO, J. DE. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 271–275, *Sept.*, 1943.—A generalization of Lie's transformation theory to include transformations from curvature elements (x, y, y', y'') into lineal elements (x, y, y'), as in the theory of evolution.

513.882 : 517.948 = 4 *see Abstr.* 21

517.2/.3 : 518.4 12

Graphical differentiation and integration. HANSEL, C. W. *Phil. Mag.*, 34, *pp.* 565–574, *Aug.*, 1943.—Describes methods additional to those given previously [Abstr. 990, 2108 (1943)], with illustrative examples. Replying to criticism of an earlier statement, it is reaffirmed that the practice of drawing tangents to cooling-curves is unlikely to lead to results of practical value. G. F. F.

517.522.3 13

A problem in the summation of series. GODDARD, L. S. *Proc. Camb. Phil. Soc.*, 39, *pp.* 200–202, *Oct.*, 1943.—The series are

$$U_n(\alpha) = \alpha^2 n^2 \sum_{m=1}^{\infty} \frac{\sin^2(\pi m/\alpha)}{m(m^2 - \alpha^2 n^2)},$$

$$V_n(\alpha) = \alpha^2 n^2 \sum_{m=1}^{\infty} \frac{m \sin^2(\pi m/\alpha)}{(m^2 - \alpha^2 n^2)^2},$$

where n is a positive integer and $\alpha > 1$. [See Abstr. 630 (1941)].

517.522.3 14

A Tauberian theorem and its application to convergence of Fourier series. IYENGAR, K. S. K. *Proc. Indian Acad. Sci. A*, 18, *pp.* 81–86, *Aug.*, 1943.—Two theorems are proved, the first being a theorem on mean convergence or summability, the second being the summability of the Fourier series of a summable (L) function $f(x)$ at a point x_0 at which $\{[f(x_0 + h) - f(x_0)] \cdot \log|h|\} \to 0$ as $h \to 0$.

517.522.3 15

New convergence and summability tests for Fourier series. IYENGAR, K. S. K. *Proc. Indian Acad. Sci. A*, 18, *pp.* 113–120, *Aug.*, 1943.

517.522.6 : 511.31 *see Abstr.* 2

517.561 : 517.949 16

Computation of polynomial functions by summation of finite differences. BENNETT, H. F. *J. Opt. Soc. Amer.*, 33, *pp.* 519–526, *Sept.*, 1943.—A quick approx. method is described for use with a calculating machine in computing a table of values of a polynomial function which itself may be an approximation to another function. Formulae are given for polynomials up to the 8th deg. whereby the computation may be based either upon the coefficients of the polynomial or upon equally spaced values of the function. Formulae are given also for predicting the max. deviation from the exact values of the polynomial. The method results in replacing the given curve by a series of overlapping parabolic arcs, each extending through 5 consecutive values of the argument.

517.564.3 : 517.65 *see Abstr.* 19

517.566.3 17

A note on the evaluation of Riemann's zeta function. HEALEY, R. H., AND MACKENZIE, J. K. *A.W.A. Techn. Rev.* [*Amal. Wireless Aust.*], 6, 3, *pp.* 125–141, 1943.—An expression is obtained that allows rapid and accurate computation of $\zeta(x) = \sum_{n=1}^{\infty} (1/n^x)$, $x > 1$; this expression applying equally well for $x = 1 + \delta$, $\delta \ll 1$, as for larger values of x. A formula for evaluating Euler's const. is deduced by considering $x \to 1$.

517.63 18

Inversion formulae for the Laplace transformation. ERDÉLYI, A. *Phil. Mag.*, 34, *pp.* 533–536, *Aug.*, 1943.—Laplace's integral equation may be written $g(s) \equiv \int_0^{\infty} e^{-st} f(t)dt$. Putting $e^{-t^2} = \sin \frac{1}{2}\theta$ gives $f(t) = e^{at} \tan \frac{1}{2}\theta\{\frac{1}{2}a_0 + a_1 \cos \theta + a_2 \cos 2\theta + \ldots\}$ where a is a chosen constant and the coefficients $a_0, a_1 \ldots$ are given in terms of g. In another form putting $(1 - 2e^{-t}) = x$, $f(t) = e^{(b-1)t}\{b_0 P_0(x) + b_1 P_1(x) + \ldots\}$ where b is a chosen constant and $P_0, P_1 \ldots$ are Legendre polynomials. An interpolation formula is derived. G. F. F.

517.63 : 531.2 *see Abstr.* 85

517.65 : 517.564.3 19

Some integrals involving Humbert function. PASRICHA, B. R. *Proc. Indian Acad. Sci. A*, 18, *pp.* 11–19, *July*, 1943.

517.933 20

On certain non-linear differential equations of the second order. LEVINSON, N. *Proc. Nat. Acad. Sci., Wash.*, 29, *p.* 281, *Sept.*, 1943.—Errata [Abstr. 2472 (1943)].

517.948 : 513.882 = 4 21

The theory and applications of reproducing kernels, I. ARONSZAJN, N. *Proc. Camb. Phil. Soc.*, 39, *pp.* 133–153, *and* 205, *Oct.*, 1943.

517.949 : 517.561 *see Abstr.* 16

518.3 : 621.396.611.1 : 534.014.2 *see Abstr.* 125

518.4 : 517.2/.3 *see Abstr.* 12

519.12 : 541.183 22

Arrangement of double molecules on a lattice. KAO, S. K., AND CHANG, T. S. *Trans. Faraday Soc.*, 39, *pp.* 288–294, *Nov.*, 1943.—A mathematical investigation of an approx. formula, deduced from the adsorption of double mols. on a solid surface, giving the equilibrium conditions and hence the number of arrangements. The latter, calculated from equilibrium properties as obtained by first and second approximations, are nearly the same. Rigorous computation of the number of arrangements for a few simple cases [Abstr. 2228 (1942)] gives results in accord with the above and supporting the approx. formula. N. M. B.

519.251.6 : 523.802 23

The elimination of the effects of accidental errors of measurement in statistical investigations. MALMQUIST, K. G. *Ark. Mat. Astr. Fys.*, 27*A*, 4, *No.* 24, [14 *pp.*], 1941.—The distribution curve for the abs. magnitudes of the stars of a given apparent magnitude is derived, assuming a Gaussian luminosity function in an element of space. The problem is identical with one discussed by Eddington [Abstr. 1722 (1940)] in correcting statistics for accidental errors, and a method is developed for correcting an observed distribution to obtain an approximation to the true distribution. Instances are given of the application of the method to problems of stellar statistics. A. HU.

519.271.3 24

On sampling in unknown fields. GHOSH, B. *Sci. and Cult.*, 9, *pp.* 129–130, *Sept.*, 1943.—[See Abstr. 354 (1942)].

519.272 25

A note on Karl Pearson's selection formulae. LAWLEY, D. N. *Proc. Roy. Soc. Edinb.A*, 62, 1, *pp.* 28–30, 1943.

519.283 : 620.11 26

Statistical analysis of inspection results. FAIRFIELD, H. H. *Engng J. Can.*, 26, *pp.* 492–501, *Sept.*, 1943.—Examples of common problems in interpretation of industrial data are given.

519.4 : 535.375.51 : 535.338.42-1 *see Abstr.* 157

519.41 27

Groups of transformations of the non-invariant subgroups. MILLER, G. A. *Proc. Nat. Acad. Sci. Wash.*, 29, *pp.* 240–242, *Aug.*, 1943.—[See Abstr. 2111 (1943)].

519 5 : 530.1 : 512 *see Abstr* 3

521.035 : 535.14 *see Abstr.* 137

522.1 : 525.4(479.22) = 82 *see Abstr.* 70

522.26 28

Setting up and adjusting the equatorial reflecting telescope. BRYDON, H. B. *J. Roy. Astr. Soc. Can.*, 37, *pp.* 57–72, *Feb., and pp.* 153–161, *April*, 1943.—Methods are described by which amateurs may set up reflecting telescopes in equatorial mountings. The treatment covers adjustments of the parts of the telescope among themselves, of the telescope to its mounting, and of the mounting to the celestial sphere. A. HU.

523.13 29

More planetary systems in the universe. SEN, H. K. *Sci. and Cult.*, 9, *p.* 131, *Sept.*, 1943. *See also Curr. Sci.*, 12, *p.* 251, *Sept.*, 1943.

523.13 30

Non-solar planetary systems. SEN, H. K. *Nature, Lond.*, 152, *pp.* 600–601, *Nov.* 20, 1943.

523.161 : 535.214 = 3 *see Abstr.* 138

523.162.2 : 523.852.3 = 82 *see Abstr.* 51

523.29 31

The discovery of a prehistoric zodiac in England. MALTWOOD, K. E. *J. Roy. Astr. Soc. Can.*, 37, *pp.* 269–276, *Sept.*, 1943.—A prehistoric earthwork zodiac or agricultural calendar 30 miles across discovered in Somerset is described, and suggestions are made as to its origin. A. HU.

523.34 32

The origin of the lunar features. MCINTOSH, R. A. *J. Roy. Astr. Soc. Can.*, 37, *pp.* 24–28, *Jan.*, 1943.—It is suggested that the maria were formed by meteoritic collisions with the plastic Moon in its youth, the level surfaces and the walled plains being formed by subsequent welling of magma during surface contraction. Further cooling produced a more resistant surface, and the size of craters diminished as the penetration by meteorites lessened. The hypothesis is supported by the distribution of certain other surface features. A. HU.

523.42 33

Observations of Venus, 1938–42, and their interpretation. HAAS, W. H., AND JOHNSON, H. M. *J. Roy. Astr. Soc. Can.*, 37, *pp.* 146–152, *April, and pp.* 193–204, *May–June*, 1943.—Observations of the planet made by 11 amateurs in U.S.A. and Germany are compared on the basis of 200 drawings and photographs made at telescopes varying in aperture from 2·5 in. to 18 in. The discussion deals chiefly with the atmospheric markings, the clouds and cusp-caps, the outline at various phases as modified by the atmosphere, and the period of rotation. A. HU.

523.44 34

Photographic observations of minor planets. KHARADSE, E. K., AND DEMIDOV, N. B. *Bull. Abastumani Astrophys. Obs.*, 6, *pp.* 97–104, 1942.—Photographic positions and deviations from ephemeris values are given for minor planets observed at Mt. Kanobili betw. July and Dec., 1940. A. HU.

523.6 35

Photographic observations of comets at Riverview College Observatory. O'CONNELL, D. J. K. *Mon. Not. Roy. Astr. Soc.*, 103, 4, *pp.* 227–229, 1943.—Photographic positions are given for comets 1937*f*, 1939*a*, 1940*d*, 1941*c* and 1941*d*. A. HU.

523.67 36

Cometary emission spectra in the visual region. SWINGS, P., MCKELLAR, A., AND MINKOWSKI, R. *Astrophys. J.*, 98, *pp.* 142–152, *Sept.*, 1943.—A list of wavelengths of the emission features in the region $\lambda > 4\,800$ is compiled mainly from measurements of spectrograms of the comets 1940*c* and 1942*f* at the McDonald, the Mt. Wilson and the Dominion Astrophysical observatories. Certain of the features behave, with resp. to the comet's heliocentric distance, as emissions from polyatomic molecules would be expected to do. Comparison of the spectrum with that of an oxyammonia flame leads to the suggested identification of a number of the emission features, among them the strong "λ6 300 group," as due to a dissociation product of ammonia, probably NH_2.

523.743 37

Note on convection in the sun. WOOLLEY, R. V.D. R. *Mon. Not. Roy. Astr. Soc.*, 103, 4, *pp.* 191–195, 1943.—Part of the flux of energy in the outer layers of the sun is supposed to be carried by convectional spheres which are identified with the visible granules. A relation is put forward betw. the mean life, contrast and size of the granulation, and comparison with the observed values of these quantities indicates a convectional velocity of betw. 2 and 3 km./sec. The thickness of the convection zone is 500 km., and the fit indicates that the temperature gradient is little disturbed from the radiative value. A. HU.

523.746 38

Final relative sunspot-numbers for 1942. BRUNNER, W. *Terr. Magn. Atmos. Elect.*, 48, *pp.* 161–162, *Sept.*, 1943.

523.746 39

Provisional sunspot-numbers for February and March, 1943. BRUNNER, W. *Terr. Magn. Atmos. Elect.*, 48, *p.* 170, *Sept.*, 1943.

523.752 40

Spectrohelioscopic observations on Mt. Kanobili in 1940. CHKHAIDSE, S. M. *Bull. Abastumani Astrophys. Obs.*, 6, *pp.* 131–164, 1942.—Positions, forms, areas and intensities are given for prominences and quiescent bright flocculi and filaments observed with the Abastumani spectrohelioscope. A. HU.

523.752 : 550.385 41

Solar flares and magnetic storms. NEWTON, H. W. *Mon. Not. Roy. Astr. Soc.*, 103, 5, *pp.* 244–257, 1943.—Recent spectrohelioscope observations and older spectroscopic records are used to discuss statistically the relation betw. intense flares (chromospheric eruptions) and magnetic storms. Far more often than could occur by chance, an intense flare within 45° of the centre of the solar disc is followed about a day later by a great magnetic storm. The mean effective time of travel of the assumed corpuscular stream is 26 hr., the most intense storms giving 20 hr. The distribution on the disc of flares preceding storms is examined, and suggestions for future observations are made. A. HU.

523.755 42

On the solar corona. ALFVÉN, H. *Ark. Mat. Astr. Fys.*, 27*A*, 4, *No.* 25, [23 *pp.*], 1941.—The corona is considered as an atmosphere of particles (electrons and ions) with energies far above that corresp. to the photospheric temperature. The empirical density function can be reproduced if the coronal light is sunlight scattered by electrons of which the energy remains almost constant at 180 eV (1·4 million deg.) in the region betw. 0·2 and 2 solar radii from the solar surface. This condition will follow if 10^{-5} of the solar energy output is used in producing high-energy particles in the upper chromosphere. The model is refined by allowing for the force on the charged particles due to the gradient of the general magnetic field of the sun. The theory explains qualitatively the emission line spectrum [Abstr. 344 (1943)] and the characteristic ray structure of the corona. A. HU.

523.755 : 523.78 = 3 43

Coronal observations before, during and after the eclipse of 21 September, 1941. WALDMEIER, M. *Z. Astrophys.*, 21, *pp.* 181–193, 1942.—Contours of the

inner corona in the light of its green and red lines are given for the eclipse day and the days before and after. The coronagraph used was at Arosa, from which the eclipse was invisible; comparisons with direct photographs in continuous light during totality are hoped for subsequently. The radial decrease of intensity away from the limb in 5 303 Å is measured at 2 position angles, and observations with a spectrocoronascope and spectrocoronagraph are discussed. Little relation exists betw. the structure of the corona and the underlying prominences and disc markings.

A. HU.

523.774 : 523.78 44

Spectrographic observations at the total solar eclipse of 1940 October 1. III. The spectrum of the extreme limb of the sun. REDMAN, R. O. *Mon. Not. Roy. Astr. Soc.*, 103, 4, *pp.* 173–190, 1943.—[See Abstr. 2799 (1942)]. Spectrograms taken just after third contact show that the spectrum < 1 sec. within the limb shows few, if any, emission lines except the Balmer lines. The transition region betw. emission and absorption is scanned by the Moon's limb in about 1 sec. of time and its study is not at present possible. Just inside the limb weak lines are strengthened, compared with the centre of the disc, but strong lines (equiv. width $> 0{\cdot}13$ Å) are weakened. This may be due to a roughness of the sun's surface which increases the effective distance from the limb. Accepting such a correction, a modified Schuster–Schwarzschild model is proposed which fits the observations reasonably. A. HU.

523.775.2 45

Intensities of hydrogen Hα and helium D_3 in prominences. BRÜCK, H. A., AND MOSS, W. *Mon. Not. Roy. Astr. Soc.*, 103, 5, *pp.* 258–264, 1943.—Equivalent widths of Hα and D_3 and their local variations in 9 prominences are determined with a modified spectroheliograph. Within a given prominence the effect of self-absorption on Hα causes the intensity ratio $H\alpha/D_3$ to decrease with increase of D_3. The results are consistent with the theoretical curve of growth corresp. to thermal motion without turbulence. A. HU.

523.78 : 523.755 = 3 *see Abstr.* 43

523.78 : 523.774 *see Abstr.* 44

523.802 : 519.251.6 *see Abstr.* 23

523.832 46

Radial velocities of proper-motion stars. II. POPPER, D. M. *Astrophys. J.*, 98, *pp.* 209–211, *Sept.*, 1943.—[See Abstr. 1461 (1942)]. New determinations of radial velocity and spectral type are given for 29 dwarfs, 19 sub-dwarfs and 1 white dwarf. Six of the dwarfs show H and K in emission. One sub-dwarf has a radial velocity of + 524 km./sec., the biggest yet found in the Galaxy. A. HU.

523.841.3 : 523.872 *see Abstr.* 60, 61

523.841.37 47

The pulsation theory of Cepheid variables. ROSSELAND, S. *Mon. Not. Roy. Astr. Soc.*, 103, 5, *pp.* 233–243, 1943.—The present state of the theory is reviewed. In the acoustic limit the mathematical representation of the observed facts is not sufficiently close, and the theory of anharmonic vibrations (which is sketched in an appendix) must be developed to account for the variation in form of the velocity curves and for the quantitative details of the period/density diagram. Interpretations of the phase lag in luminosity and of the period/luminosity law are likely to prove the criterion for success of any theory of Cepheid variability. A. HU.

523.841.37.035.9 = 82 48

On the phases of variation of radii of the chromospheres and photospheres of Cepheids. MELNIKOV, O. A. *Bull. Abastumani Astrophys. Obs.*, 6, *pp.* 79–95, 1942. *Summary in English.*—The observed amplitudes of variation of magnitudes measured at 5 570 Å and 4 100 Å in 18 Cepheids agree with the values calculated from the colour temperatures when the former are corrected for variation of radii. The radiation of Cepheids thus deviates little from the black-body type. Photospheric radii obtained from the radiation temperatures show the well-known ¼-period phase lag compared with the chromospheric radii, a conclusion opposed to that of Becker [Abstr. 1224 (1942)]. The agreement obtained by Becker, betw. a period-luminosity curve calculated from "pulsation parallaxes" and the observed curve, is illusory. A. HU.

523.842.3 49

A new orbit for the spectroscopic binary θ^2 Orio A. MÜNCH, G. *Astrophys. J.*, 98, *pp.* 228–230, *Sept.*, 1943.—New elements obtained from 22 spectrograms do not differ significantly from those of Struve [Abstr. 502 (1925)]. A. HU.

523.842.3 50

The composite binary system HD 144208–9. PETRIE, R. M. *J. Roy. Astr. Soc. Can.*, 37, *pp.* 277–291, *Sept.*, 1943.—Measures of the radial velocities shown by this system are analysed, and the period of revolution, the orbital elements and the mass-ratio derived. Spectrophotometric measurements show that the primary is a *d*F9 star typical of the main sequence, but that the secondary is an A0 sub-dwarf of luminosity 0·01 and density 1 000 in solar units.

A. HU.

523.852.3 : 523.162.2 = 82 51

Colour indices of 155 extragalactic nebulae. VASHAKIDSE, M. A. *Bull. Abastumani Astrophys. Obs.*, 6, *pp.* 57–70, 1942. *Summary in English.*—Photographs of 45 areas between $-20°$ and $+90°$ dec. taken on a Schmidt camera in light of 2 wavelengths are used to derive colour indices of 155 extragalactic nebulae to a mean error of $\pm 0{\cdot}10$ mag. Photometric calibration was performed by using extrafocal images of the North Polar Sequence and by a tube photometer. The mean colour index drops from 0·95 for type E to 0·76 for type Sc, the irregular nebulae forming an arm of the evolutionary sequence additional to the 2 previously recognized. Dependence of the measured colour index on magnitude and diameter is attributed to the fact that the nuclei of spirals have higher colour indices than their arms. From the variation of colour index with galactic latitude the total selective absorption across the Galaxy from N. to S. is found to be 0·20 mag.

A. HU.

523.852.32 52

Differential motions in spiral nebulae indicated by certain traces of dark matter. LINDBLAD, B.

Ark. Mat. Astr. Fys., 27*B*, 4, *No.* 13, [8 *pp.*], 1941.—A network of dark lanes radiating from a dark nebula in the spiral of M 81 is regarded as resulting from the dissection of the cloud by the dissolving wave motion at the point of contact betw. the spiral arm and the central system. The phenomenon is claimed as a proof that the direction of rotation of the system is the direction in which the arms open out from the centre. A. HU.

523.854 53

Galactic research in Holland during 1942. BOK, B. J. *Astrophys. J.*, 98, *pp.* 235–239, *Sept.*, 1943.—A summary of papers by Oort, van Tulder and Oosterhoff in *Bull. Astr. Inst. Netherlands*, No. 353, Oct., 1942. The position of the galactic pole is determined from objects of high galactic concentration and from star counts. The blueness of distant Cepheids and the absence of spiral nebulae in Cygnus suggest the presence of an obscuring peripheral ring around the Galaxy. The density of long-period variables is found to decrease as the 5th power of the distance from the galactic centre, and their galactic concentration is a sensitive criterion of distance. For such high-velocity stars the coeffs. of differential rotation are not the same as for other stars, so the observed small rotation effects do not conflict with their large distances. A paper by Pannekoek in *Publ. Astr. Inst. Univ. Amsterdam* No. 7 investigates the effect of absorbing nebulae on star counts and deduces the position and structure of the dark nebulae in Taurus-Auriga, Ophiuchus and Cygnus. A. HU.

523.854.12 54

An attempt to represent the dark nebula at θ Ophiuchi with the aid of absorbing screens. WALLENQUIST, Å. *Ark. Mat. Astr. Fys.*, 27*B*, 4, *No.* 14, [5 *pp.*], 1941.—The observed star numbers for various luminosity groups within the obscuring cloud near θ Ophiuchi can be represented by a veil of nebulous matter at 250 psc. absorbing 0·5 mag., and another at 800–1 000 psc. absorbing 1·0 to 1·5 mag. A. HU.

523.854.12 55

The dark nebulae in Cygnus, Cepheus, Cassiopeia and Ophiuchus. VANÄS, E. *Ark. Mat. Astr. Fys.*, 27*B*, 4, *No.* 15, [8 *pp.*], 1941.—A method of analysis which eliminates numerically the effect of dispersion in the absolute magnitudes is applied to star counts in these regions, assuming that the log. of the cumulative star numbers is linear with the corresponding lim. magnitude, and that the real star distribution is the same in bright and dark areas. Distances and absorptions are given for the obscuring clouds which best fit the observations. A. HU.

523.854.12 = 82 56

Colour indices of 1758 stars in five Kapteyn's areas in the galactic plane. KHARADSE, E. K. *Bull. Abastumani Astrophys. Obs.*, 6, *pp.* 17–55, 1942. *Summary in English.*—Colour indices of about 350 stars down to mag. 13·5 in each of 5 Selected Areas near the galactic equator are determined from photographic and photovisual magnitudes and calibrated by direct comparison with the North Polar Sequence. The mean error of a tabulated colour index is about $\pm$ 0·06 mag. Using Bergedorf spectral types, average values of colour index for a given spectral class are deduced magnitude by magnitude; the dependence of colour on distance shows clear evidence for space-reddening. The Abastumani programme is to be extended to 115 Selected Areas in and away from the galactic plane. A. HU.

523.854.12 = 82 57

The distribution of stars of different spectral classes in dark and bright regions of the Milky Way. VASHAKIDSE, M. A. *Bull. Abastumani Astrophys. Obs.*, 6, *pp.* 72–78, 1942. *Summary in English.*—Star counts by spectral type are made in the dark and bright regions of 21 Selected Areas in the Milky Way. The excess of early-type stars in bright regions is interpreted as due to the presence of absorbing matter in the dark regions, or to the existence of a spiral arm of the Galaxy containing hot stars. Curves are drawn showing the dependence on magnitude of the star density in bright and dark regions; their bifurcation marks the beginning of an absorbing cloud. A. HU.

523.872 58

Gradients and colour temperatures of γ Cassiopeiae. EDWARDS, D. L. *Mon. Not. Roy. Astr. Soc.*, 103, 4, *pp.* 222–226, 1943.—Objective-prism spectrograms of γ Cass and δ Cass taken betw. 1938 and 1941 are used to follow the changes of colour temperature of γ Cass during its outburst. The probable error of a single gradient observation is $< \pm 0{\cdot}02$. A fairly rapid increase of T to a max. of 35 000° in early 1940 was followed by a fall to 23 000° in July, 1940, and a further rise during 1941. The temperature changes are accompanied by spectrum changes which are briefly described. An early correlation betw. gradient and number of visible Balmer emission lines is not maintained. A. HU.

523.872 59

Measures of total intensities in the lines of H and Ca II in stellar spectra. STRUVE, O. *Astrophys. J.*, 98, *pp.* 231–235, *Sept.*, 1943.—A summary of results by Barbier, Chalonge and Morguleff published in *Annales d' Astrophysique*, 1942. The widths of Hγ, Hδ and Ca II *K* are measured for 200 bright stars of types earlier than K. Graphs show the relation between equiv. width and spectral type, and between equiv. width and depth and sharpness of the Balmer discontinuity. The latter, which is a measure of luminosity, correlates strongly with width of Hγ, but not so well with that of *K*. A. HU.

523.872 : 523.841.3 60

The spectrum of AX Monocerotis (HD 45910). STRUVE, O. *Astrophys. J.*, 98, *pp.* 212–224, *Sept.*, 1943.—The spectral lines of this star show rapid changes in intensity and structure and in velocity. A violet absorption component of Hϵ is occasionally suppressed by Ca II, and doubling of the H absorption lines is accompanied by doubling in Ca II, Ni II and He I. The spectrum is remarkable for the prominence of sharp Ni II lines. It is suggested that violent surges of expansion originate in low atmospheric levels (perhaps from local spots in the photosphere), extend through all the upper layers and give rise to the observed P Cygni lines. The sharp lines may come not from a continuous layer at intermediate height but from areas not affected by this local prominence action. A. HU.

523.872 : 523.841.3 61

Changes in the line contours of ε UMaj. STRUVE, O., AND HILTNER, W. A. *Astrophys. J.*, 98, *pp.* 225–227, *Sept.*, 1943.—Lines due to ionized metals in the spectrum of this star become double at phases near 1·5 and 3·7 days after the min. of the *K* line, which varies in the main period of 5·09 days. The doubling, which does not affect the over-all width, is not due to orbital motion but perhaps to a combination of physical changes and Doppler effect in a rotating star. A. HU.

523.872 = 3 62

Quantitative analysis of the B0 star τ Scorpii. I–III. UNSÖLD, A. *Z. Astrophys.*, 21, *pp.* 1–21, *and pp.* 22–84, 1941, *and pp.* 229–248, 1942.—Part I consists of measures of line intensity in the spectrum of this B0 dwarf in the region 3 324–6 563 Å. The spectrograms used were taken at the coudé and Cassegrain foci of the McDonald telescope. Equivalent breadths and central intensities are tabulated for 2 dispersions. In Part II the spectrum is interpreted and mean values are derived for the surface temperature ($28\,150 \pm 750$°K.), the electron pressure P ($\log P$/dyne cm.$^{-2} = 3{\cdot}07 \pm 0{\cdot}25$) and the surface gravity g ($\log g$/cm.sec.$^{-2} = 4{\cdot}93 \pm 0{\cdot}40$). The abundances of the light elements are estimated and compared with the values observed for meteorites, the sun, and the planetary nebulae. The ratios H : He and C : N are discussed in rel. to the constitution and energy processes in the star's interior. In Part III the continuous absorption coeff. is calculated, the main contributors to the absorption being H, He, He^+ and free electrons (Compton effect). By taking into account the change of absorption coeff. with wavelength, good agreement with observation is found. A. HU.

523.873 63

McCormick spectral statistics. VYSSOTSKY, A. N., AND WILLIAMS, E. T. R. *Astrophys. J.*, 98, *pp.* 185–186, *Sept.*, 1943.—A summary is given of the spectral statistics of the second proper-motion programme of this observatory. The 441 regions are uniformly distributed over $\frac{2}{3}$ of the sky.

523.873 64

Galactic structure and kinetic theory. VYSSOTSKY, A. N., AND WILLIAMS, E. T. R. *Astrophys. J.*, 98, *pp.* 187–191, *Sept.*, 1943.—The apparent galactic concentrations of main-sequence stars can be predicted from those of A stars by an assumption of equipartition of energy. The much smaller apparent concentrations of stars of the giant branch are consistent with their larger kinetic energies.

523.873 : 539.155.2 65

The occurrence of carbon isotopes in the spectra of N-type stars. SHAJN, G. A. *Bull. Abastumani Astrophys. Obs.*, 6, *pp.* 1–16, 1942.—Six members of the sequences −1 and −2 of the Swan bands belonging to the $C^{13}C^{12}$ molecule are newly identified in N-type stars, and a second member of the sequence + 1 is also found. Other sequences of the Swan bands and the CN bands are not suitable for the detection of C^{13}, but some evidence is found for the presence of $C^{13}C^{12}$ molecules. Intensity anomalies found in comparing the various isotopic bands are interpreted in terms of the curves of growth. The abundance ratio C^{13}/C^{12} varies from star to star within the limits 0·05 to 0·50. This high value confirms that the Bethe cycle is not the one responsible for energy generation in the red giants. A. HU.

523.877 66

Point-source stellar models with opacity due to electron scattering. HENRICH, L. R. *Astrophys. J.*, 98, *pp.* 192–204, *Sept.*, 1943.—Work is extended [Abstr. 2972 (1942)] to massive stars with convective cores and radiative envelopes in which the opacity is due to electron scattering. A series of models is constructed, applicable to stars of mass up to 100 suns, allowing for the effect of radiation pressure in the equation of hydrostatic equilibrium. The mass/luminosity relation gives upper limits to the luminosities. The central temperatures are too low for the carbon cycle to operate. A. HU.

523.877 = 3 67

Speed of establishment of thermodynamic ionization equilibrium in the convection zone of a stellar atmosphere. UNSÖLD, A. *Z. Astrophys.*, 21, *pp.* 307–319, 1942.—The author examines the conditions in which deviations from thermodynamic equilibrium can occur in a stellar convection zone. Cyclic processes involving photo-ionization followed by 2-body recombination and collision ionization followed by 3-body recombination are considered. The exp. value for the recombination coeff. in gas discharges is about 100 times bigger than that corresp. to the first process, and the second is not important enough in a star to account for the discrepancy. The time needed to establish ionization equilibrium in the hydrogen convection zone (though not in prominences) is so short (about 0·05 sec.) that convectional streaming at 1 km./sec. cannot upset local thermodynamic equilibrium. This conclusion is opposite to that arrived at by Eddington [Abstr. 2018 (1941)]. A. HU.

523.877 = 3 68

Ionization equilibrium and the structure of the hydrogen convection zone. BIERMANN, L. *Z. Astrophys.*, 21, *pp.* 320–346, 1942.—In the hydrogen convection zone of the sun, electron impacts alone suffice to adjust the excitation conditions in a convection element to the local temperature and pressure in 0·1 to 1 sec. The ultra-violet excess in the solar radiation cannot be explained as an effect of turbulence in the convective zone, since insufficient H^+ ions are convected to the surface. The variation of physical properties with depth is examined for 2 limiting models of the convection zone: one in which the energy transport is by radiation, the other in which it is by adiabatic convection. The second model encounters less difficulties than the first, though in the outer layers the temperature gradient lies betw. the values given by the 2 models. A. HU.

523.899 69

Supplement to the Mount Wilson catalogue and bibliography of stars of classes B and A whose spectra have bright hydrogen lines. MERRILL, P. W., and BURWELL, C. G. *Astrophys. J.*, 98, *pp.* 153–184, *Sept.*, 1943.—A list of 250 additional bright-line stars of classes B and A. Notes record unpublished data concerning stars in the original *Catalogue*, as well as those in the *Supplement*. The bibliography includes 407 articles (386 published since 1932).

525.4 : 522.1(479.22) = 82 70

Determination of the latitude and longitude of Abastumani Observatory on Mt. Kanobili based on observations in 1939. TEVSADSE, G. A. *Bull. Abastumani Astrophys. Obs.*, 6, *pp.* 105–130, 1942. *Summary in English.*—A Bamberg transit instrument equipped with a recording micrometer was used to obtain the longitude and, by Talcott's method, the latitude. The results are: long. $2^h51^m18^s.082 \pm 0^s.0053$; at. $+41°\ 45'\ 18''.19 \pm 0''.02$. A. HU.

525.44 71

The variation of latitude at Greenwich, 1936–40. *Mon. Not. Roy. Astr. Soc.*, 103, 5, *pp.* 277–278, 1943.—Observations on the floating zenith-telescope are discussed and latitude variations derived. A. HU.

525.75 : 551.593.55 72

The brightness of the zenith sky during twilight. II. CHIPLONKAR, M. W., AND RANADE, J. D. *Proc. Indian Acad. Sci. A*, 18, *pp.* 121–125, *Aug.*, 1943.—Measurements in green and red light are made during both morning and evening twilight at greater altitudes than those previously used [Abstr. 2574 (1941)]. The zenith brightness is given in terms of stellar magnitudes with the sun betw. 9° and 18° below the horizon. A. HU.

527 : 538.7(09) *see Abstr.* 234

529.781 73

The short-period erratics of free-pendulum and quartz clocks. GREAVES, W. M. H., AND SYMMS, L. S. T. *Mon. Not. Roy. Astr. Soc.*, 103, 4, *pp.* 196–209, 1943.—Three types of erratic of short period are recognized in the performance of precision clocks: erratics of phase only (Type A), erratics of rate only (Type C), and an intermediate type (B) arising either from fluctuations of rate about a mean value or from accidental change of phase. A ratio is derived which indicates the degree of admixture of the 3 types in any series of observations. Free-pendulum clocks show all 3 types and therefore suffer from "wandering" by accumulation; but quartz clocks show only type A erratics, which do not affect the long-period performance. In so far as the long-period performance of a clock is determined by short-period erratics, quartz clocks are therefore better than the free-pendulum type. A. HU.

53 : 656.2 74

The nature and purpose of physics as applied to some railway problems. EAMES, T. A. *J. Sci. Instrum.*, 20, *pp.* 169–175, *Nov.*, 1943.—This account of problems studied by the L.M.S. Rly. Research Dept. deals with refrigeration and the transport of food, including design of insulated containers; heating and ventilation, with notes on the measurement of dust in the atmosphere and the efficiency of dust filters; noise reduction; and photometry. A. E. T.

53 : 666 75

Some physical procedures used in ceramic research. BOLE, G. A., AND LOOMIS, G. A. *J. Appl. Phys.*, 14, *pp.* 443–450, *Sept.*, 1943.

53.081.5 : 621.317.081.5 76

On the dimensions of physical magnitudes (third paper: electric and magnetic magnitudes). DINGLE, H. *Phil. Mag.*, 34, *pp.* 588–599, *Sept.*, 1943.—An earlier error is corrected [Abstr. 2020 (1942)] and dimensions are developed for quantity, electric field intensity, potential difference, capacitance, magnetic pole, magnetic field intensity, electric current and e.m.f. in that order. The fine-structure const. is discussed. [*See* Abstr. 42 (1943), 2022 (1942)]. G. F. F.

53.087.5 77

Measuring photographically. CATLIN, F. H. *Gen. Elect. Rev.*, 46, *pp.* 503–504, *Sept.*, 1943.—Repeated recording of instantaneous values is made in two ways. Steam and air flow by manometers which are backed by moving photographic paper and illuminated by an intermittent light in front. Air temperature is recorded by instantaneous photography of a bank of pyrometer indicators. The inclusion of a clock and counter on the records defines the sequence. E. H. W. B.

530.1 78

The fundamental concepts of natural philosophy. MILNE, E. A. *Proc. Roy. Soc. Edinb. A*, 62, 1, *pp.* 10–24, 1943.—James Scott Lecture.

530.1 : 519.5 : 512 *see Abstr.* 3

530.12 79

Matter, electricity and gravitation in flat space-time. BIRKHOFF, G. D. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 231–239, *Aug.*, 1943.—A brief summary of a unified theory of quanta, electromagnetism and gravitation. Flat space-time is assumed as well as a perfect fluid whose energy tensor is $T_{ij} = \rho u_i u_j - p\,\delta_{ij}$ and whose equations of motion are $\partial T_{ij}/\partial x = f_i$, where f_i is the force vector. Using the principle of mathematical simplicity, f_i is shown to consist of 3 parts: one involving the derivatives of the "atomic potential" (not here defined), a second involving the derivatives of the electromagnetic potentials and the velocities u_i linearly, and a third in which the derivatives of the gravitational potentials and the quadratic products of u_i appear. The displacement of the perihelion of Mercury and the gravitational shift of spectral lines can be accounted for on this theory. G. C. McV.

530.12 : 531.18 *see Abstr.* 82

530.145.63 : 512.831 80

The algebra of meson matrices. KEMMER, N. *Proc. Camb. Phil. Soc.*, 39, *pp.* 189–196, *Oct.*, 1943.—The paper solves the following problem: given s elements β_μ which satisfy $\beta_\lambda\,\beta_\mu\,\beta_\nu + \beta_\nu\,\beta_\mu\,\beta_\lambda = \beta_\lambda\delta_{\mu\lambda} + \beta_\nu\,\delta_{\mu\lambda}$; to find the number and nature of the non-equivalent matrix representations of the β_μ. The number of representations is $\frac{1}{2}s + 1$ for s even and $\frac{1}{2}(s+5)$ for s odd. G. C. McV.

531.114 81

Remarks on a simplified derivation of the Coriolis acceleration. HAURWITZ, B. *Bull. Amer. Met. Soc.*, 24, *pp.* 194–195, *May*, 1943.

531.18 : 530.12 82

The fundamental equations of electron motion (dynamics of high speed particles). MACCOLL, L. A. *Bell. Syst. Techn. J.*, 22, *pp.* 153–177, *July*, 1943.

531.19 83

Statistical mechanics of binary mixtures. ALFREY, T., AND MARK, H. *J. Chem. Phys.*, 11, *p.* 496, *Oct.*, 1943.—[See Abstr. 2269 (1942)].

531.19 : 532.74 84

Statistical mechanics of dimerization in perfect solutions. RUSHBROOKE, G. S. *Proc. Camb. Phil. Soc.*, 39, *pp.* 202–204, *Oct.*, 1943.

531.19 : 537.591 *see Abstr.* 217

531.2 : 517.63 85

Applications of the operational calculus to the theory of structures. PIPES, L. A. *J. Appl. Phys.*, 14, *pp.* 486–495, *Sept.*, 1943.—The differential equations governing the deflection of structural elements such as loaded cords and beams freely suspended or resting on an elastic foundation are solved operationally.

531.224.5 : 744.345.3 : 513.515.6 *see Abstr.* 6

531.23 : 539.31 86

A numerical procedure for the calculation of the moments in edge reinforcements of cutouts in monocoques. HOFF, N. J. *J. Appl. Mech.*, 10, *A*161–*A*167, *Sept.*, 1943.—A numerical example of a ring reinforcing a doubly symmetrical cutout in a fuselage under the action of bending moments is given.

531.252.3 87

Stresses due to forces and couples acting in the interior of an infinite elastic slab placed on a rigid foundation. SEN, B. *Bull. Calcutta Math. Soc.*, 35, *pp.* 13–20, *March*, 1943.—Expressions are found for the stresses and displacements due to a force or a couple acting inside an infinite elastic slab of finite and uniform thickness which rests on and adheres to a perfectly rigid foundation. The problems seem to have important applications in soil mechanics. In the solutions, the stresses are expressed as integrals, and in the case of a couple, a method is given for finding the approx. numerical stresses on the plane base. G. E. A.

531.259 88

Stress distribution in cylindrically aeolotropic plates. CARRIER, G. F. *J. Appl. Mech.*, 10, *A*117–*A*122, *Sept.*, 1943.—The following problems are solved: The ring under uniform radial internal and external pressure; the extension to include the complete disc; the rotating disc; the curved beam bent by end couples; the dislocation problems of the ring; the hydrostatic-stress problem; the force and the couple applied to the vertex of a wedge; and the force applied at a point in the infinite plate.

531.259.2 89

Elastic properties of curved tubes. VIGNESS, I. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 105–120, *Feb.*, 1943.—A theory of flexibility of pipe bends—the plane of the bend is established. Experimental results show the pipes to be more flexible than expected from the application of the rod theory. A flexibility factor is obtained, identical with that found for the bending of pipe in the plane of its bend. The increased flexibility is caused by a distortion of the cross-section of the pipe. There is no change in the torsional rigidity of the curved tube as compared with the rod theory. Transverse stresses similar to those caused by bending in the plane of the bend are set up in the pipe wall. Longitudinal stresses are concentrated at their point of max. value and are of greater magnitude than expected from ordinary theory.

531.3 : 62 90

A brief account of modern kinematics. JONGE, A. E. R. DE *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 663–683, *Aug.*, 1943.—Shows what the various problems of plane kinematics are and how they are approached and solved by simple means. The elements of a simple universal terminology are given, and the various branches of plane kinematics are reviewed briefly. Quantitative kinematic synthesis is presented briefly. Remarks on graphical methods are added.

531.73 : 541.182.6 *see Abstr.* 304

531.733 : 591.12 91

A volumetric respirometer for aquatic animals. SCHOLANDER, P. F., HAUGAARD, N., AND IRVING, L. *Rev. Sci. Instrum.*, 14, *pp.* 48–51, *Feb.*, 1943.—A closed-circuit respirometer is described which circulates a given vol. of water through the chamber containing the fish and equilibrates the water with a small vol. of air. Continuous, direct measurements can be made at any intervals and for many hr. The instrument shows accurately the use of $\frac{1}{10}$ ml./hr. of oxygen.

531.754.2 92

Removal of air from powders in density determination. GOODEN, E. L. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 578–579, *Sept.* 15, 1943.

531.754.2 93

Density of carbon black by helium displacement. ROSSMAN, R. P., AND SMITH, W. R. *Industr. Engng Chem.*, 35, *pp.* 972–976, *Sept.*, 1943.—The densities of 3 commercial carbon blacks were calculated from X-ray data and compared with those obtained by immersion in He and in water. By comparing the density of the parallel-layer groups, as determined from X-ray data, with the He immersion density of the cluster, the free space within the particle can be evaluated. In acetylene black, this free space is accessible to He and is evidenced by a drift in the density value.

531.787.2 94

A method of increasing the sensitivity of Bourdon gauges. BARNARTT, S., AND FERGUSON, J. B. *Rev. Sci. Instrum.*, 14, *pp.* 46–47, *Feb.*, 1943.—An optical lever system magnifies the movement of concavo-convex Bourdon gauges by a factor of 545. The system has a reproducible null point independent of temperature that varies linearly, although slightly, with pressure. The sensitivity graph is linear, and direct pressure measurements can be made to the nearest 0·005 mm. Hg.

532.13 95

Bulb correction in capillary-tube viscometry. SCHOFIELD, R. K., AND BLAIR, G. W. S. *Nature, Lond.*, 152, *pp.* 477–478, *Oct.* 23, 1943.

532.13 96

Flow of visco-elastic materials in capillaries. MERRINGTON, A. C. *Nature, Lond.*, 152, *p.* 663, *Dec.* 4, 1943.—[See Abstr. 2520 (1943)].

532.13 97

Viscosity of solutions in branched-chain paraffins. MCARDLE, E. H., AND ROBERTSON, A. E. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 484–487, *Aug.* 15, 1943.—Solutions of an alkyd-type resin, and

of a natural and 2 substitute rubbers, at high conc. in 2 pentanes, 4 hexanes, 5 heptanes and 2 octanes show higher abs. and rel. viscosities in the branched paraffins than in the corresponding normal paraffins. An arbitrary method of predicting the viscosity of the resin solutions in branched paraffins has been devised.

532.13 : 666.1/.2 98

The viscosity and working properties of glass. II. The rate of cooling and setting of colourless and coloured glasses. BOOW, J., AND TURNER, W. E. S. *J. Soc. Glass Technol.*, 27, *pp.* 94–112 (*T*), *June*, 1943.—The glasses comprised 5 commercial types, colourless and coloured, based on a soda–lime–silica composition, 2 colourless alkali–lead-oxide glasses, a high-softening-point boroaluminosilicate and a soda–silica glass [see Abstr. 1344 (1943)]. In addition, 8 glasses, coloured blue by Co_2O_3, present in varying conc. up to 5%, were studied. Determinations were made by Pt-PtRh thermocouples of the temperatures at the glass surface and at intermediate points within the interior when cooling under 2 sets of conditions. From the temperatures recorded at different times of cooling, the corresp. viscosities were deduced.

532.133 : 532.712 *see Abstr.* 110

532.133 : 532.77 : 541.24 99

Molecular weights of high polymers. HUGGINS, M. L. *Industr. Engng Chem.*, 35, *pp.* 980–986, *Sept.*, 1943.—Methods for the estimation of mol. wt. of high polymers from properties of their dilute solutions are critically discussed.

532.133 : 541.124 100

The zone of activation in rate processes. BARRER, R. M. *Trans. Faraday Soc.*, 39, *pp.* 237–241, *Sept.–Oct.*, 1943.—The physical and statistical basis of the zone theory of diffusion and viscosity [Abstr. 1023 (1943)] is outlined, and a criticism [Abstr. 1744 (1943)] is shown to be unfounded. Further experimental behaviour is described which is predicted by the zone theory, but which is contrary to the transition-state theory.

532.51 : 533.6 : 62 101

Experimental fluid dynamics applied to engineering practice. HANKINS, G. A. *Trans. N.-E. Cst Instn Engrs Shipb.*, *pp.* 23–46, 1943.—Dynamical similarity in fluid motion and the use of the Reynolds, Froude and Mach numbers in laboratory experiments are considered. Practical applications of the basic principles are described, by means of oil flow in lubricated bearings, fluid flow and frictional resistance in smooth and rough pipes, wind pressures on buildings and structures, river and tidal estuary models, fluid motion at high speeds, air resistance of projectiles and supersonic wind tunnels.

532.517.2 102

A formula for the stream function of certain flows. BERGMAN, S. *Proc. Nat. Acad. Sci. Wash.*, 29, *pp.* 276–281, *Sept.*, 1943.

532.542.1 103

On the uniform convergence of the solutions of the Navier–Stokes equations. THOMAS, T. Y. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 243–246, *Aug.*, 1943.—The methods of tensor analysis are used to show that any stationary or non-stationary motion is stable in any fixed, finite region bounded by one or more surfaces at rest or in motion relative to arbitrary finite disturbances, provided its deformation tensor is sufficiently small; in particular, if the deformation tensor vanishes, the motion is always stable. Application of the theory to Poiseuille motion of a fluid in a circular pipe shows that the motion is stable for $R \leqslant 13$ approx. The usually accepted criterion, $R \nrightarrow 1\,000$, for the damping out of large disturbances, and Orr's criterion, $R < 180$, for stability of Poiseuille motion rel. to infinitely small axial symmetric disturbances, are briefly discussed.

J. S. G. T.

532.583.4 : 532.59 104

The approximate calculation of wave resistance at high speed. HAVELOCK, T. H. *Trans. N.-E. Cst Instn Engrs Shipb.*, *pp.* 47–58, 1943.—A brief survey of the wave theory is given and this leads to a subdivision of the ship and the corresp. source distribution; the determination of the latter is based on sectional areas and local prismatic coefficients. For low speeds a large number of divisions is necessary for reasonable approximation and the calculations become too laborious, but results have been obtained for speeds higher than a Froude number $\sqrt{(v/gL)}$ of about 0·4. These approximations are applied to experimental models with mathematical lines, and the results compared with those calculated from the usual integrals and with the measured resistances. Finally the method is applied to 2 models with non-mathematical lines, the necessary data being obtained from the plans and the results compared with measured resistances.

532.59 : 532.583.4 *see Abstr.* 104

532.612.4.042 : 541.183 105

The properties of freshly formed surfaces. I. The application of the vibrating-jet technique to surface-tension measurements on mobile liquids. ADDISON, C. C. *J. Chem. Soc.*, *pp.* 535–541, *Nov.*, 1943.—A practical technique and simple mathematical treatment are described which enable the method to be applied to measurement on pure mobile liquids and to the study of adsorption at freshly formed surfaces. The method is applicable to liquids of widely different density, surface tension, and chemical nature, and the constants are independent of temperature.

532.613.2.08 : 541.265 106

Surface tension of white phosphorus. HUTCHINSON, E. *Trans. Faraday Soc.*, 39, *pp.* 229–234, *Sept.–Oct.*, 1943.—Measurements were made by the Sugden max. bubble pressure method which obviates need for finding the contact angle. Results at 50°, 54°, 60·2° and 68·7°C. are, respectively, 69·70, 68·53, 66·95 and 64·95 (± 0·3) dynes/cm. The calc. parachor of atomic P is 51·2, giving a true parachor which supports a ring structure for the P mol. The calc. Eötvos const. is 1·38, indicating molecularity 2, which suggests that, of the various polymers present in molten P, the P_2 mol. is the most surface-active. A method of measuring the interfacial tension of P by a modification of the above Sugden method is described.

N. M. B.

532.62 107

Film formation by pure liquids. FOULK, C. W., AND BARKLEY, J. E. *Industr. Engng Chem.*, 35,

pp. 1013–1016, *Sept.*, 1943.—Water, benzene, nitrobenzene, ether, acetone, *n*-heptane and methanol were tested for film-forming properties by 3 methods. When these liquids are highly purified, they do not form films. The purification consisted in drastic reduction of the water content.

532.62 : 536.423.8 108

Influence of surface films of oil on the evaporation of water. POWELL, R. W. *Trans. Faraday Soc.*, 39, *pp.* 311–318, *Nov.*, 1943.—The results of the experiments described agree with available data and show that monomolecular oil films cause but little reduction in the rate of evaporation from an underlying water surface, but that multimolecular oil films can have appreciable effect. The reduction becomes relatively greater as the air velocity is increased, and the order of the effect can be estimated from the diffusion coeffs. of water vapour through air and oil.

N. M. B.

532.694.1 : 678 : 679.5 109

Froth flotation of rubber and resin components of milkweed and other plants that contain resins, rubber, balata or related gummy substances. TURRALL, W. T., KLASSEN, J., AND SMEDLEY, H. *Canad. J. Res. B*, 21, *pp.* 195–201, *Oct.*, 1943.

532.7 : 535.324.2 : 541.132 *see Abstr.* 290

532.712 : 532.133 110

Osmotic pressure and viscosity measurements with cellulose acetate fractions. BARTOVICS, A., AND MARK, H. *J. Amer. Chem. Soc.*, 65, *pp.* 1901–1905, *Oct.*, 1943.—The sp. viscosities were determined at conc. up to 0·5 vol. % of solute. The slopes of the η_{sp}/c_v *v.* c_v curves can be repr. by $k' = 0{\cdot}170$. The o.p. were measured up to 0·8 wt. % of solute. The slopes of the π/c_2 *v.* c_2 curves can be repr. by $\mu = 0{\cdot}43$. The $[\eta]$-values for all fractions can be expressed by M_2 according to eq. $[\eta] = 1{\cdot}04 \times 10^{-2} \times M_2\, 0{\cdot}67$.

532.72 111

An electrolytic study of linear diffusion of silver salts. LAITINEN, H. A. *Trans. Electrochem. Soc.*, 82, *pp.* 289–296, 1942.—[See Abstr. 319 (1940)]. The theory of diffusion is applied to the case of a single metal salt undergoing electroreduction to the metal, with the diffusion process occurring in a linear column and assuming virtually complete concentration polarization of the cathode. The theoretical current/time relationship is applied to the diffusion of $AgNO_3$, $AgC_2H_3O_2$ and Ag_2SO_4 and compared with exp. data. The effect of an indifferent salt is analogous to the suppression of the migration current in polarographic current/voltage curves.

532.739.2 : 541.132 *see Abstr.* 291

532.739.2 : 541.134 : 541.124.7 112

Activity coefficients of lead chloride determined from e.m.f. and solubility data at 25° in ethylene-glycol–water solutions. GARRETT, A. B., BRYANT, R., AND KIEFER, G. F. *J. Amer. Chem. Soc.*, 65, *pp.* 1905–1907, *Oct.*, 1943.—The e.m.f. values of the cell Pb(Hg), $PbCl_2$, AgCl, Ag were determined in approx. 20, 40, 60, 80 and 100% ethylene-glycol–water solutions of $PbCl_2$. The values of the activity coefficients were calculated from the solubility and the cell data. [See Abstr. 2257 (1943)].

532.74 : 531.19 *see Abstr.* 84

532.77 113

The molal depression constant for camphor. MELDRUM, W. B., SAXER, L. P., AND JONES, T. O. *J. Amer. Chem. Soc.*, 65, *pp.* 2023–2025, *Oct.*, 1943.—The uncertainty in the value of the molal depression const. for camphor has been caused by the fact that the const. changes with changing conc.

532.77 : 541.24 : 532.133 *see Abstr.* 99

532.782 : 669.018 114

The constitution of magnesium-manganese-zinc-aluminium alloys in the range 0–5% magnesium, 0–2% manganese, 0–8% zinc. II. The composition of the $MnAl_6$ phase. RAYNOR, G. V., AND HUME-ROTHERY, W. *J. Inst. Met.*, 69, *pp.* 415–421, *Sept.*, 1943.—[See Abstr. 2160 (1943)]. Crystals were isolated by anodic attack from binary Mg-Al alloys, and from ternary and quaternary alloys containing Mg and/or Zn, and chemical analysis confirmed the composition $MnAl_6$, and showed that no Mg was taken up by the compound when Mg was present in the alloy. $MnAl_6$ crystals extracted from alloys containing Zn gave inter-planar spacings identical with those of pure $MnAl_6$ crystals, indicating the absence of Zn in the compound. However, chemical analysis indicated that quantities of Zn up to 0·4% occurred in crystals extracted from alloys in the range 0–5% Mg, 0–2% Mn and 0–8% Zn. A. C. W.

532.782 : 669.018 115

The constitution of magnesium-manganese-zinc-aluminium alloys in the range 0–5% magnesium, 0–2% manganese, and 0–8% zinc. III. The 500° C. and 400°C. isothermals. LITTLE, A. T., RAYNOR, G.V., AND HUME-ROTHERY, W. *J. Inst. Met.*, 69, *pp.* 423–440, *Oct.*, 1943.—[See Abstr. 114 (1944)]. At 500°C. the solubility of Mn in Al was greatly reduced by the presence of Mg and/or Zn. In the ternary system Mg-Zn-Al, nearly all the alloys were of the simple α-primary solid-solution type at 500°C., except for those with the highest Mg and Zn contents, which were just within the (α + liquid) area. The boundaries were established between the α, (α + $MnAl_6$) and (α + $MnAl_6$ + liq.) fields for the quarternary system at 500°C. The solubility of Mn in the alloys was negligible at 400°C., and all the alloys contained the compound $MnAl_6$. When T is used to denote the intermediate ternary phase based on the composition $Al_2Mg_3Zn_3$, the alloys of the ternary system Mg-Zn-Al were found to lie either in the α or the (α + T) fields, the solubility curve having a characteristic form. A. C. W.

532.782 : 669.018 116

The constitution of magnesium-manganese-zinc-aluminium alloys in the range 0–5% magnesium, 0–2% manganese, and 0–8% zinc. IV. The equilibrium diagram below 400°C. LITTLE, A. T., RAYNOR, G. V., AND HUME-ROTHERY, W. *J. Inst. Met.*, 69, *pp.* 467–484, *Nov.*, 1943.—The structure of Mg-Mn-Zn-Al alloys has been investigated at temps. below 400°C. The alloys were rich in Al, but it was found necessary to investigate alloys containing much higher percentages of the solute elements. The α/(α + T) phase boundary is of the form (Mg)(Zn) = K, where the constant K is expressed by the relation $d \log K/d\theta = Q/R\theta^2$, where θ is the absolute temp. This relationship may be employed for calculating the

boundary conditions at any temp. except when the Zn content is very small. Alloys of the ($\alpha + MgZn_5$) type were found when the Al content was low, but the $MgZn_5$ phase was never formed under the ordinary conditions of annealing when the Al content was high. The α-solid solution splits up into 2 face-centred cubic structures of different compositions in the case of the binary system Al-Zn. A. C. W.

533.16 : 536.423.1 117

Boiling point and viscosity. NISSAN, A. H. *Nature, Lond.*, 152, *p.* 630, *Nov.* 27, 1943.—[See Abstr. 2722 (1943)].

533.16 = 3 118

Viscosity of air at pressures of 1–30 kg./cm.² KELLSTRÖM, G. *Ark. Mat. Astr. Fys.*, 27*A*, 4, *No.* 23, [15 *pp.*], 1941.—The author extends his measurements [Abstr. 1557 (1937)] by the rotating-cylinder method to higher pressures, using suspensions of various sections and materials. Corrections are applied to allow for the variation with pressure of the dimensions of the apparatus, of the restoring force of the suspension, and of the refr. index of the air in the pressure vessel. The viscosity η in gm.cm.$^{-1}$ sec.$^{-1}$ at 20°C. varies with the excess pressure p in kg./cm.² according to the formula $\eta = (18\,204 + 11{\cdot}75\,p + 0{\cdot}120p^2)\,10^{-8}$. A. HU.

533.24 119

A combined hydrogen and helium liquefier. SCHALLAMACH, A. *J. Sci. Instrum.*, 20, *pp.* 195–196, *Dec.*, 1943.—The liquid H_2 necessary for pre-cooling the He is produced *in situ*. The He is liquefied by Simon's adiabatic expansion method and the liquid H_2 is produced in a Linde apparatus. Both liquefiers are housed in the same evacuated chamber. Only one H_2 circuit is employed.

533.5 = 3 120

Detection of leaks in glass vacuum apparatus. BENEDICKS, C., AND SEDERHOLM, P. *Ark. Mat. Astr. Fys.*, 27*B*, 4, *No.* 16, [2 *pp.*], 1941.—A method is described for using an ordinary induction coil instead of a Tesla coil for detecting leaks, and the use of benzene instead of CO_2 or alcohol for surrounding a suspected leak is recommended. A. HU.

533.56 121

The suppression of the evaporation of mercury from diffusion lamps. BULL, C. S., AND KLEMPERER, O. *J. Sci. Instrum.*, 20, *pp.* 179–181, *Nov.*, 1943.—Pumping speed and ultimate vacua produced by diffusion pumps are limited by unwanted evaporation of mercury from warm surfaces of the pump. A new design of pump, liquid-air trap and shutter, is described; all critical surfaces are water-cooled; the trap offers small pumping resistance though every vapour molecule is bound to strike a liquid-air-cooled, concave surface. The conventional tap is replaced by a metal shutter.

533.6 : 62 : 532.51 *see Abstr.* 101

533.6.013 : 629.135 122

Aerodynamic centre, control and stability of airplanes. REISSNER, H. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 625–628, *Aug.*, 1943.

533.662 123

Pressure distribution on propeller blades. TAYLOR, J. L. *Trans. N.-E. Cst Instn Engrs Shipb.*, *pp.* 59–76, 1943.—The paper gives general methods for calculating the distribution of pressure and suction over the face and back of propeller blades for any given working conditions not involving cavitation and flow breakdown. The methods given, which have been substantiated by numerous wind-tunnel pressure-plotting tests, are illustrated by numerical application to mathematically derived blade sections, and the design of sections to minimize the peak suction is discussed. Mathematical results bearing on the question of blade interference, important near the blade-roots of high-disc-area screws, are presented. The basic screw theory is that of a previous paper [Abstr. 1031 (1942)], but a refinement consists in calculating an approx. allowance for inflow gradient.

534.014.2 124

An advanced laboratory experiment on forced damped oscillations. CRITTENDEN, E. C., JR. *Amer. J. Phys.*, 11, *pp.* 282–286, *Oct.*, 1943.

534.014.2 : 621.396.611.1 : 518.3 125

A universal resonance chart. YATES, H. G. *Engineer, Lond.*, 176, *pp.* 268–269, *Oct.* 1, 1943.—When a sinusoidal force F acts with frequency f on a mass m which has an elastic restraint of stiffness s together with viscous damping characterized by a constant r, the steady-state solution is $u = (F/Z)\cos(2\pi ft - \phi)$, where Z is the mech. impedance. Resonance occurs when Z has a min. value and the frequency is $\sqrt{(s/m)}/2\pi = f_0$. Writing $Q = 2\pi f_0 m/r$, ϕ may be derived from $\tan\phi = Q(f/f_0 - f_0/f)$. In radio work, $Q = 2\pi f_0 L/R_0$, const. over a wide range of frequencies. $Z = r/\cos\phi$, and the response, in terms of the response at resonance, $u/u_0 = \cos\phi\cos(2\pi ft - \phi)$ The information in these equations is embodied in a nomogram, the scales of which give the per cent mistuning, values of Q, and a middle line with, on one side, the response as a per cent of the response at resonance, and on the other the corresponding phase shift. G. E. A.

534.1.013 : 629.123.22 126

The design-office problem in the estimation of the torsional resonance characteristics of small marine Diesel-propulsion units. MITCHELL, R. W. S. *Proc. Instn Mech. Engrs, Lond.*, 149, 4, *pp.* 133–142, 1943.—A discussion on torsiographs is followed by the theory of the energy method of calculation, with ref. to the calculation of vibration amplitudes assuming linear damping ∝ the phase velocity of the vibration. Harmonic input torque diagrams are given for a small marine 2-stroke engine.

534.112 127

String under intermittent impulses and experimental verification of Kar's theory of intermittent action. MANE, H. G., AND BISWAS, B. N. *Indian J. Phys.*, 17, *pp.* 97–99, *April*, 1943.—A stretched string was subjected to impulses from a 32-toothed rubber wheel driven by motor, and its motion was recorded by a vibroscope. The photographic record in each case, when the point struck by the teeth was varied, was a regular series of vibrations. A pin was fixed to one of the teeth and ⊥ the plane of the wheel, and the vibrations maintained as before. The photograph of the point struck by the wheel shows in this case that the motions of pin and string are

coincident, and Kar's theory as applied by Biswas to a bowed string is verified. G. E. A.

534.113 128

The free lateral vibrations of a cantilever beam with a terminal dashpot. McBride, E. J. *J. Appl. Mech.*, 10, *A*168–*A*172, *Sept.*, 1943.—The beam has frequency bands or ranges, separated by regions of zero frequency. In any given range the frequency varies continuously with rate of decay and dashpot strength, the frequency decreasing with increase of dashpot strength. In the first mode a critical dashpot strength exists such that when overstepped the frequency is zero. The natural shape of the deflection curve consists of 2 standing waves separated by a time lag of 90 deg. G. E. A.

534.131 = 3 129

Measurements for the theory of natural oscillations of circular rings of arbitrary thickness. Kuhl, W. *Akust. Z.*, 7, *pp.* 125–152, *July*, 1942.—Steel rings with rectangular cross-section of different thicknesses were examined, incl. the full disc. The 5 principal forms of oscillations are dealt with, viz. vibrations of radial elongation, of tangential displacement, torsional vibration and flexural vibrations in the plane of the ring and $\perp$ this plane. The oscillations were excited magnetically and the frequency measured with a piezo-electric pick-up, with an accuracy within $\pm 2‰$. R. N.

534.131 130

The vibration characteristics of nearly complete "free-free" circular rings. Bundy, F. P., and Bankes, C. W. *J. Appl. Phys.*, 13, *pp.* 652–662, *Oct.*, 1942.—In connection with the vibrations of piston rings the authors have measured the frequencies, frequency ratios, vibration amplitudes and mech. const. of nearly complete rings of various diameters and cross-sections for vibrations $\parallel$ and $\perp$ the plane of the ring. Positions of nodes are tabulated, and general expressions are found for the frequencies. G. E. A.

534.131 131

The vibration characteristics of "free-free" circularly curved bars. Pliskin, W. A., Edwards, J. E., and Bundy, F. P. *J. Appl. Phys.*, 14, *pp.* 410–417, *Aug.*, 1943.—The investigation of circular rings is continued to determine the positions of nodes and the frequencies of curved bars with central angles from 356° to 60°. For vibrations in the plane of curvature the relative positions of the nodes are the same for the same central angles whatever the type of cross-section. Expressions are also given for the frequencies of the nth mode of parallel and transverse vibration. The theoretical frequency constants derived by Ikebe [Abstr. 3925 (1938)] agree with those found by experiment. G. E. A.

534.321.33 : 78 132

The problem of the keyboard instrument. III. Lloyd, L. S. *Phil. Mag.*, 34, *pp.* 674–684, *Oct.*, 1943.—[See Abstr. 2738 (1943)]. The cycle of frequencies 1, $\frac{8}{9}$, $\frac{5}{6}$, $\frac{4}{5}$, $\frac{3}{4}$, $\frac{5}{3}$, $\frac{15}{8}$, 2 is not a necessary element of the structure of a musical scale, as is evident from a consideration of the earlier (modal) music of Western Europe, as well as from some modern music; this viewpoint is discussed in detail. This excursion into the early history of English music is necessary for the elucidation of the problem of the keyboard instrument as a whole. Helmholtz showed that the musical scale, in its scientific aspect, is a problem in the physiological and psychological sections of the theory of hearing. The work of Ellis is discussed, with ref. to mistakes in his translation of Helmholtz's work. H. H. HO.

534.632 133

An oscillographic method for the determination of the velocity of sound. Lenihan, J. M. A. *Nature, Lond.*, 152, *p.* 662, *Dec.* 4, 1943.—[See Abstr. 2318 (1943)].

534.834 134

Sound attenuation in air ducts. Churcher, B. G., and King, A. J. *Engineering*, 156, *pp.* 221–222, *Sept.* 17, 1943.—Measurements of sound attenuation were made by means of an experimental brick duct 28 ft. long, closed on the top by movable concrete slabs and comprising input, measurement and terminal portions. The first contained a loud-speaker on a motor-driven turntable; in the second, the tube of a search-tube microphone was plugged in and the sound pressure measured, and in the third, residual sound energy was absorbed by a mass of cotton waste. Resulting sound pressures along the duct were plotted against distance for given frequencies, with an absorptive lining of the duct. In some cases with low attenuation, marked standing waves were observed. Ventilating systems with felt-lined ducts may have little effect on the l.f. noises from fans and motors. G. E. A.

534.845.1 = 3 135

Sound-damping of walls against speech and music. Capek, J. *Akust. Z.*, 7, *pp.* 152–156, *July*, 1942.—A method of determining the protective effect of a wall against a certain disturbing sound [Abstr. 2538 (1938)] is described, allowing of stating accurately in phons the effect on the sound intensity. R. N.

535.1 136

The intensity distribution of proper vibrations. Power, S. *Proc. Roy. Irish Acad.A*, 49, *pp.* 91–100, *Aug.*, 1943.—The sp. density of black-body radiation is $\propto$ (refr. index, n)^3 for non-dispersive media in thermodynamic equilibrium. It is sought to obtain the analogue of the n^3 law for ψ waves. The building up of the Boltzmann distribution law on this basis is considered. A. J. M.

535.14 : 521.035 137

On the negative hydrogen ion and its absorption coefficient. Chandrasekhar, S., and Krogdahl, M. K. *Astrophys. J.*, 98, *pp.* 205–208, *Sept.*, 1943.—The continuous absorption coeff. of H^- to the red of 5 000 Å is governed by the wave function of the ground state at distances of the order of 5 times the Bohr radius from the centre. The wave functions now in use are not accurate enough at this distance to give reliable coeffs. beyond 5 000 Å. Objective criteria are stated for testing the reliability of an absorption curve. A. HU.

535.14 : 537.533.74 *see Abstr.* 211

535.214 : 523.161 = 3 138

Calculation of radiation pressure on absorbing particles. Schalén, C., and Wernberg, G. *Ark. Mat. Astr. Fys.*, 27*A*, 4, *No.* 26, [18 *pp.*], 1941.—

Curves are derived showing the relation betw. radiation pressure on small absorbing spheres of Fe, Ni, Zn and Cu and their size and the wavelength of the monochromatic radiation absorbed. Graphical integration of these curves gives values of the radiation pressure as a function of size for different temperatures of the source of black-body radiation. For all interstellar absorbing particles the ratio of radiation pressure to gravitational attraction in the neighbourhood of a star reaches a max. for a certain diameter which is about 5×10^{-6} cm. for a B2 star and increases to 2×10^{-5} cm. for a gK0 star. This range of size is also found from spectrophotometric studies of interstellar reddening. A. HU.

535.231.2 139

The blackbody. BENFORD, F. *Gen. Elect. Rev.*, 46, *pp.* 377–382, *July, and pp.* 433–440, *Aug.*, 1943. —The revised values of the fundamental constants c, h and k lead to values for c_2 and σ of $14\,384{\cdot}8$ μdeg. and $5{\cdot}6728 \times 10^{-6}$ μW/cm.^{2} respectively. Using these values, charts are prepared giving the distribution of energy in the radiation from a blackbody at any temperature. To a close approximation, $\frac{1}{4}$ of the total power radiated is on the short-wavelength side of the max. The radiation of a blackbody in terms of photons is dealt with in a similar manner. Two charts are given showing respectively the spectral distribution of radiation and the summation of radiation (to any wavelength) for a blackbody radiating a total of 1 W. J. W. T. W.

535.243 140

Construction of monochromator cams for recording spectrophotometers. MORAN, J. M. *Rev. Sci. Instrum.*, 14, *pp.* 287–293, *Oct.*, 1943.—Procedures are described which permit the use of an optical filter with sharp absorption bands to supplement emission-line data in the layout of a wavelength cam. The range 355–1 200 mμ is covered. [See Abstr. 4217 (1935)].

535.243 : 535.247.4 141

Calibration of a photo-electric colorimeter for the determination of chlorophyll. COMAR, C. L., BENNE, E. J., AND BUTEYN, E. K. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 524–526, *Aug.* 15, 1943.—Gives the results of an analysis of chlorophyll from 24 different plant sources, using 3 different std. preparations. Deviations of 75% from the true values may be found, depending on the purity of the std. used. Calibration by means of a simple plant extract analysed for chlorophyll, using spectrophotometry, avoids the uncertainties involved in the use of std. preparations. J. W. T. W.

535.243 : 535.81 142

The visual spectrophotometry of glasses, with special reference to low-absorptive glasses. WANG, T. H. *Phil. Mag.*, 34, *pp.* 684–699, *Oct.*, 1943.—[Abstr. 1920 (1943)].

535.243 : 544.62 143

A spectrophotometric method for the analysis of multicomponent mixtures and its infra-red application. BRATTAIN, R. R., RASMUSSEN, R. S., AND CRAVATH, A. M. *J. Appl. Phys.*, 14, *pp.* 418–428, *Aug.*, 1943.—The method is based on the assumption that the optical density of a mixture = the sum of the optical densities of the components, although the transmissions of the individual components may not follow Beer's law. The application to infra-red absorption vapour samples is described in detail. The results of tests using a 6-component C_4 hydrocarbon mixture are given.

535.247.4 : 535.243 *see Abstr.* 141

535.316 144

The graph of the lens equation in three variables. ANDREWS, C. L. *Amer. J. Phys.*, 11, *pp.* 293–296, *Oct.*, 1943.

535.317 145

On some optical systems employing aspherical surfaces. LINFOOT, E. H. *Mon. Not. Roy. Astr. Soc.*, 103, 4, *pp.* 210–221, 1943.—Burch's principle [Abstr. 2846 (1942)] that any spherical surface can be anastigmatized by an aspherical plate at its centre of curvature is applied to systems consisting of 2 mirrors and a nearly plane-parallel plate. The only flat-fielded anastigmat with both mirrors spherical is equiv.' to the field-flattened Schmidt. General formulae derived for the first 4 Seidel errors of such systems are applied to the design of a flat-fielded aplanat with accessible image. The performance of this system is estimated. A. HU.

535.317.5 146

On aspheric anastigmatic systems. BURCH, C. R. *Proc. Phys. Soc., Lond.*, 55, *pp.* 433–444, *Nov.*, 1943.—The Seidel aberrations of aspheric systems are discussed by means of the optical see-saw diagram [Abstr. 2846 (1942)]. The conditions for anastigmatism of a 2-mirror pair and a refracting singlet are deduced, and 2 flat-fielded anastigmatic singlets are designed.

535.317.9 147

The designing of non-spherical surfaces. *Proc. Phys. Soc., Lond.*, 55, *pp.* 481–496, *Nov.*, 1943.—A discussion held by the Optical Group.

535.321 : 535.514.2 148

The measurement of anomalous dispersion in opaque dielectrics. LAWSON, A. W. *Rev. Sci. Instrum.*, 14, *pp.* 38–43, *Feb.*, 1943.—An apparatus is described by which the index of refr. of opaque materials may be determined as a function of wavelength. The method is based on the determination of Brewster's angle by reflection of polarized light from a polished surface. Typical data are given and the precision and accuracy of the method are discussed. E. R. A.

535.324.2 : 532.7 : 541.132 *see Abstr.* 290

535.33 : 621.39 149

Recent applications of the quartz and X-ray spectrographs to Post Office problems. TAYLOR, R. *Pap. Instn Post Off. Elect. Engrs, No.* 177, [10 *pp.*], *rec. Oct.*, 1943.

535.33.03 150

An improved electrode holder for spectrographic analysis. SCRIBNER, B. F., AND CORLISS, C. H. *J. Opt. Soc. Amer.*, 33, *pp.* 515–518, *Sept.*, 1943.—Describes a form of holder which provides easy and precise adjustment of the electrodes to give correct alignment and any desired separation of the electrodes, water cooling of the electrode clamps and

ready adjustment of the distance of the holder from the spectrograph slit. A special assembly for d.c. arc excitation is also described; this incorporates a cupped graphite anode which allows the sample to become very hot without any attack on the pedestal.

J. W. T. W.

535.336.2 151

The mass spectrometer as an analytical tool. WASHBURN, H. W., WILEY, H. F., AND ROCK, S. M. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 541–547, *Sept.* 15, 1943.—Discussing the mass spectrometer as an analytical tool, the paper describes the method of analysis, presents results obtained with this method, and gives information reg. the commercial instrument in use.

535.338.3 : 538.615 : 546.29 152

The spectra of the rare gases and their Zeeman effects. GREEN, J. B. *Phys. Rev.*, 64, *pp.* 151–155, *Sept.* 1 *and* 15, 1943.—The Zeeman effect of the rare gases is discussed from the standpoint of the coupling scheme of Shortley and Fried. The matrices for the interaction are calculated and also the g factors from the transformations to LS coupling for the p^5f configurations. The Paschen–Back patterns are determined. The calculated patterns are compared with observed structures.

535.338.4 : 546.171 153

The Schuster band of ammonia, and the electrical synthesis of hydrazine. WILLEY, E. J. B. *Trans. Faraday Soc.*, 39, *pp.* 234–237, *Sept.–Oct.*, 1943.—Experiments are described which support the theory [Abstr. 2737 (1936)] that the Schuster band of NH_3 originates in a reaction: $NH_3 + NH \rightarrow N_2H_4' \rightarrow N_2H_4 + h\nu$.

535.338.42 : 546.21 154

New bands in the first negative (or visible) O_2^+ band-system. SINGH, N. L., AND LAL, L. *Sci. and Cult.*, 9, *p.* 89, *Aug.*, 1943.

535.338.42 : 535.375.51 *see Abstr.* 171, 172

535.338.42 : 541.124.7 : 546.262.3 155

Spectral and collision data of CO^+ and the dissociation energy of carbon monoxide. ASUNDI, R. K. *Proc. Indian Acad. Sci. A.*, 18, *pp.* 8–10, *July*, 1943.

535.338.42 : 548.0 156

Frequency spectrum of crystalline solids. II. General theory and applications to simple cubic lattices. MONTROLL, E. W. *J. Chem. Phys.*, 11, *pp.* 481–495, *Oct.*, 1943.—[See Abstr. 2078 (1942)]. The frequency spectrum of a simple cubic lattice is studied by deriving its polynomial approximation from its moments. The spectrum has 2 max., one near the middle of its frequency range and the other at the h.f. end. As the ratio of the interactions between next nearest neighbours to those of nearest neighbours increases, the height of the l.f. max. increases and that of the h.f. max. decreases. Sp. heats are calculated from the moments of the frequency distribution.

535.338.42-1 : 535.375.51 : 519.4 157

Interpretation of the spectra of polyatomic molecules by use of group theory. MEISTER, A. G., CLEVELAND, F. F., AND MURRAY, M. J. *Amer. J. Phys.*, 11, *pp.* 239–247, *Oct.*, 1943.—An elementary explanation of the use of the group theory formulae in obtaining the number of fundamental vibrations belonging to each vibration type (or state) and the activity of the fundamentals, combinations, and overtones in the Raman and infra-red spectra.

535.342-31 = 3 158

Light absorption of some sulphur compounds in ultra-violet light. SJÖBERG, B. *Z. phys. Chem. B*, 52, *pp.* 209–221, *Oct.*, 1942.—Extinction curves are given for various mercaptans, sulphides, acetylized mercaptans and aceton compounds. Measurements to 1 850 Å were made with a small quartz spectrograph. Tentative conclusions are drawn reg. constitution.

R. N.

535.343 : 541.651.22 159

The effect of molecular environment on the absorption spectra of organic compounds in solution. III. Compounds containing the chromophore $>C=\overset{|}{C}-\overset{|}{C}=N-$. EVANS, L. K., AND GILLAM, A. E. *J. Chem. Soc.*, *pp.* 565–571, *Nov.*, 1943.—In continuation of earlier work [Abstr. 107 (1941)] the absorption of $\alpha\beta$-unsaturated aldehydes is discussed. Derivatives of carbonyl compounds containing the chromophore $>C=\overset{|}{C}-\overset{|}{C}=N-$ were examined. The thiosemicarbazones of saturated aldehydes and ketones exhibit absorption bands near 2 700 Å which are 500 times more intense than those of the parent carbonyl compound.

535.343-31 160

Studies on lignin and related compounds. LXXII. The ultra-violet absorption spectra of compounds related to lignin. LXXIII. The ultra-violet absorption spectra of ethanol lignins. PATTERSON, R. F., AND HIBBERT, H. *J. Amer. Chem. Soc.*, 65, *pp.* 1862–1873, *Oct.*, 1943.—The spectra of pyrocatechol and pyrogallol-1,3-dimethyl ether, their methyl ethers and various derivatives in which a C side chain is substituted *para* to the phenolic hydroxyl have been determined. The spectra of amorphous lignins can be explained on the assumption that they are derived from lignin precursors of the types exemplified by hydroxy derivatives of 1-(4-hydroxy-3,5-dimethoxyphenyl)-1-propanone. A carbonyl group or an ethylenic double bond is present in conjugation with the aromatic nucleus.

535.343-31 : 541.636 161

The ultra-violet absorption spectra of some derivatives of chrysene. JONES, R. N. *J. Amer. Chem. Soc.*, 65, *pp.* 1815–1818, *Oct.*, 1943.—The similarity betw. the ultra-violet absorption spectra of 6-isopropenylchrysene and 6-methylchrysene is attributed to the action of steric hindrance which prevents the ethylenic group from acquiring a configuration co-planar with the chrysene ring system. The spectra of certain acetylchrysenes and of a chrysene derivative containing an alicyclic ring attached at the 5,6-positions are recorded and discussed.

535.343-31 : 541.636 162

The ultra-violet absorption spectra of arylethylenes. JONES, R. N. *J. Amer. Chem. Soc.*, 65, *pp.* 1818–1824, *Oct.*, 1943.—The ultra-violet absorption spectrum of tetra(9-phenanthryl)-ethylene is recorded, and compared with that of a 4M solution of phenanthrene.

535.343-31 : 546.17 163

Absorption spectrum of N_2 in the extreme ultra-violet. WORLEY, R. E. *Phys. Rev.*, 64, *pp.* 207–224, *Oct.* 1 *and* 15, 1943.—Data are presented for an extensive Rydberg series of bands, which are interpreted and correlated with previous observations. The ionization potential of N_2 corresp. to the limit is 15·577 V. Absorption beyond this point is complete for a path of $\sim 0{\cdot}5$ mm. atm. The internuclear distance increases with energy up to values 40% larger than for the normal state. Vibrational constants are unexpectedly small, and the ratio ω'/B' is about $\frac{1}{2}$ the const. value for all the lower states of N_2.

535.343.4 : 546.212 164

Hitherto unidentified absorption bands of water vapour. COWLING, T. G. *Nature, Lond.*, 152, *p.* 694, *Dec.* 11, 1943.

535.345 : 535.434 *see Abstr.* 178

535.371 : 577.16A 165

The fluorescence of vitamin A. SOBOTKA, H., KANN, S., AND LOEWENSTEIN, E. *J. Amer. Chem. Soc.*, 65, *pp.* 1959–1961, *Oct.*, 1943.—The fluorescence of vitamin A esters in alcoholic solution first increases then decreases under continued ultra-violet irradiation. Both processes are of photochemical nature, but the second one is impeded by flushing with inert gases. The phenomenon is shown by vitamin A_2 ester, but not by the free vitamin A alcohol.

535.372 166

Fluorescence of uranyl salts. SATYANARAYANA, B. S. *J. Mysore Univ. B*, 4, 4, *pp.* 57–61, 1943.—The spectra of the fluorescence of uranyl nitrate both at laboratory and liquid-air temperatures were studied under high dispersion. The spectra excited by polarized light reveal complete depolarization. The structure of the bands prominently displayed at low temperatures arises out of a Stark splitting of levels due to crystal fields.

535.375.5 167

Raman spectrum of O-methyl isourea hydrochloride. EDSALL, J. T. *J. Amer. Chem. Soc.*, 65, *pp.* 1814–1815, *Oct.*, 1943.

535.375.5 : 541.132 *see Abstr.* 292

535.375.5 : 541.64 = 3 168

Studies on the Raman effect: on the structure of dimeric Al-trimethyl and Al-trihalogenide respectively. KOHLRAUSCH, K. W. F., AND WAGNER, J. *Z. phys. Chem. B*, 52, *pp.* 185–201, *Oct.*, 1942.—The structure of dimeric Al derivatives is investigated experimentally and theoretically. The methyl and halogen derivatives have probably the same structure. A better proof is given for the probability previously stated [Abstr. 311 (1944)] that the dimeric Al derivatives have a configuration similar to that of ethylene.

R. N.

535.375.51 169

On the Raman spectra of methyl and ethyl sulphide in the solid state. SIRKAR, S. C., AND BISHUI, B. M. *Sci. and Cult.*, 9, *pp.* 90–91, *Aug.*, 1943.

535.375.51 170

Depolarization studies of Raman lines. A simplified method. GLOCKLER, G., AND BAKER, H. T. *J. Chem. Phys.*, 11, *pp.* 446–449, *Oct.*, 1943.—A simplified method for the determination of the depolarization factor of Raman lines is reported which requires only 1 exposure. Two Polaroid films are placed at the front of the slit of the spectrograph, one above the other. The electric vectors of the radiation are at rt. angles to one another. Between the Polaroid films and the slit are introduced 2 $\frac{1}{2}$-wave mica plates which orient the electric vectors of the light so that they are both vibrating in the same direction upon striking the prism faces.

535.375.51 : 519.4 : 535.338.42-1 *see Abstr.* 157

535.375.51 : 535.338.42 171

Raman effect of sodium cyanide. GLOCKLER, G., AND BAKER, H. T. *Proc. Iowa Acad. Sci.*, 49, *pp.* 295–301, 1942.—The fundamental frequency of the CN-group is shown to be 2 086·7 cm^{-1}, the 838 cm^{-1} line obtained by earlier investigators being due to the cyanate ion present as impurity. The force const. is calculated and compared with that obtained for the CN-group in other molecules. The potential function is examined and other constants calculated.

A. H.

535.375.51 : 535.338.42 172

Raman spectra of acetylenes. VII. Symmetrical-top acetylenes. CLEVELAND, F. F., AND MURRAY, M. J. *J. Chem. Phys.*, 11, *pp.* 450–454, *Oct.*, 1943. Raman frequencies, rel. intensities and depolarization factors are given for 1-iodo-1-propyne, 1-bromo-1-propyne, 1-chloro-1-propyne and 3,3-dymethyl-1-butyne. Assignments of the frequencies to the different vibration types and calculated values of the heat capacities for the ideal gasous state at 1 atm. pressure are given for 1-iodo-1-propyne and 1-bromo-1-propyne. [See Abstr. 1779 (1942)].

535.376 : 541.183 173

Electrification and luminescence phenomena accompanying desorption of gases from metals. MCBAIN, J. W., AND GLASSBROOK, C. I. *J. Amer. Chem. Soc.*, 65, *pp.* 1908–1909, *Oct.*, 1943.—When various gases are passed over a metal that is cooling during sorption and desorption, the gas stream on the outward side becomes electrified, and causes luminescence on the walls of a silica tube. The effect is ascribed to electrified ultra-microscopic particles released from the metal.

535.4 : 537.531 *see Abstr.* 207

535.41 : 535.81 174

Principles of the use of non-reflecting films in optical instruments. GREENLAND, K. M. *Nature, Lond.*, 152, *pp.* 290–292, *Sept.* 11, 1943.

535.43 175

Propagation of radiation in a scattering and absorbing medium. HULBURT, E. O. *J. Opt. Soc. Amer.*, 33, *p.* 505, *Sept.*, 1943.—A correction. [Abstr. 1070 (1943)].

535.43 176

Distribution of light intensity within a scattering medium. NEWTON, R. R. *J. Appl. Phys.*, 14, *pp.* 481–486, *Sept.*, 1943.—An integro-differential equation is developed which gives the intensity as a function of position and direction. The scattering properties of an infinitesimal volume of the medium are assumed known.

535.43 : 541.182.6 *see Abstr.* 305

535.434 177

Optical theory of chromatic emulsions and of the Christiansen experiment. RAMACHANDRAN, G. N. *Proc. Indian Acad. Sci. A*, 18, *pp.* 67–79, *July*, 1943.—A theory has been worked out, *de novo*, on the basis of the diffraction of light by a sphere immersed in a medium of nearly the same refr. index. Expressions are derived for the intensity of the transmitted light, and of the light diffracted in other directions. These are discussed in rel. to the intensity and the spectral nature of the light.

535.434 : 535.345 178

Absorption of light by small drops of water. RUEDY, R. *Canad. J. Res. A*, 21, *pp.* 79–88, *Oct.*, 1943.—When the extinction coeff. k in the formula $I/I_0 = e^{-kz}$ changes from 10^{-4} (visible region) to 10^3 (infra-red absorption bands for water in bulk), k for water in very small drops, calculated according to Mie's theory, increases as long as λ is $>$ the radius a of the particle. With $\lambda < a$ k for the extinction by water particles with strong absorption is $<$ that for transparent particles. The main features of k per unit area of the drop remain unchanged by absorption; first there is a rapid increase with decreasing λ for particles of given a until $a/\lambda = 1/n$ (the reciprocal of the index of refr.), then a gradual approach to a max., slightly $< 4\pi a^2$ as $2a/\lambda$ increases to unity, and when λ is quite small, a decrease towards a const. value after a small number of fluctuations that reach their greatest amplitudes near the integer multiples of $2a/\lambda$.

535.434 : 541.182.5 179

Opacity changes in gel-forming mixtures during setting. II. Thorium phosphate, cerium phosphate, thorium arsenate and stannic phosphate gels. DESAI, T. V., AND GURUSWAMY, S. *Proc. Indian Acad. Sci. A*, 18, *pp.* 31–39, *July*, 1943.—The changes in the opacity with time of the gels formed from different amounts of the constituents of the gel-forming mixture and the effects of HCl and non-electrolytes on the course of gel formation were investigated. Non-electrolytes decrease, while HCl increases the rate of change of opacity. The final values of opacity vary with the conc. of the constituents.

535.434 : 551.593.63 180

Experiments to elucidate scattering in the sky and in optical instruments. ZANSTRA, H. *Mon. Not. Roy. Astr. Soc.*, 103, 5, *pp.* 265–276, 1943.—Measurements on the scattering of light by small rock-salt crystals in a saturated NaCl solution show that for deflections $r < 20'$ the scattering is due to diffraction. For $20' < r < 5°$ the intensity I is $\propto r^{-2\cdot28}$, a law similar to that observed for long-range scattering around a stellar image in astronomical photography. In the latter case, the scattering may be produced by small ice crystals in the atmosphere, or perhaps by instrumental defects. A. HU.

535.436 : 551.593.5 181

Simplified formulae for scattered and rescattered sunlight. SILBERSTEIN, L. *J. Opt. Soc. Amer.*, 33, *pp.* 526–532, *Sept.*, 1943.—Formulae given by Hammad and Chapman [Abstr. 3599 (1939)] for the reception of sunlight scattered by a flat, non-refracting atmosphere are simplified by reductions and by discarding unimportant terms. The contribution due to secondary scattering is from 0·10 to 0·16 that due to primary scattering. A. HU.

535.514.2 : 535.321 *see Abstr.* 148

535.55 : 539.31 182

Photo-elastic separation of principal stresses by oblique incidence. DRUCKER, D. C. *J. Appl. Mech.*, 10, *A*156–*A*160, *Sept.*, 1943.—In the method of oblique incidence the model is rotated about the axis of p, the algebraically larger princ. stress, through a measured angle, and the retardation (fringe order) is determined in addition to the usual photo-elastic measurements. The method is exemplified by the case of a diagonally loaded bakelite square, and comparison with Frocht's results indicate that the method of oblique incidence is more accurate than that of graphical integration. The method can also be employed to distinguish betw. isotropic points at which the princ. stresses are both zero and those where they are equal but not zero. G. E. A.

535.611 183

Colour designations for lights. KELLY, K. L. *J. Opt. Soc. Amer.*, 33, *pp.* 627–632, *Nov.*, 1943.—An extension of the ISCC-NBS system of names for the description of the colours of drugs and medicines has been made for describing the colours of lights. The chromaticity ranges identified by hue names are defined by areas on the ICI chromaticity diagram.

535.653 184

Colour matching—what the dyer sees. WATERS, E. *J. Soc. Dy. Col., Bradford*, 59, *pp.* 261–266, *Dec.*, 1943.—[See Abstr. 657 (1943)].

535.7 185

Factors in human visual resolution. WALLS, G. L. *J. Opt. Soc. Amer.*, 33, *pp.* 487–505, *Sept.*, 1943.—Purports to summarize the information available on the various forms of visual-pattern discrimination, including the visibility of single lines or points (bright on dark or dark on bright), the resolution of a pair of points or a pair of parallel lines, vernier acuity (i.e. the detection of lack of alignment of 2 lines) and stereo-acuity. Not only the observed phenomena but suggested theories in explanation are described. J. W. T. W.

535.7 186

Some aspects of the eye as an image-forming mechanism. OGLE, K. N. *J. Opt. Soc. Amer.*, 33, *pp.* 506–512, *Sept.*, 1943.—It is now thought that small differences in the relative size of the images formed on the two retinae may be important in binocular vision. The author deals with the size of the image formed by an eye, the refractive error of which is corrected by a lens. He goes on to consider the origin of spherical refractive errors in the eye. J. W. T. W.

535.7 187

The effect of hue on dark adaptation. LOWRY, E. M. *J. Opt. Soc. Amer.*, 33, *pp.* 619–620, *Nov.*, 1943.—The reduction in time necessary to dark-adapt the eyes by wearing red goggles for approx. 30 min. is due to the reduced brightness of the visual field as viewed through the goggles and not to the wavelength region involved.

535.733.5 188

A single judgment test for red-green discrimination. HARDY, L. H. *J. Opt. Soc. Amer.*, 33, *pp.* 512–

514, *Sept.*, 1943.—A series of colours, in the form of enamel slips, are mounted on a movable disc which is covered with an opaque lid with 2 windows so placed that 2 of the coloured slips can be seen simultaneously. The subject is asked to state which of the two is redder and the samples are so chosen and arranged that the test will pick out observers who make the errors of the typical protanope or the typical deuteranope. J. W. T. W.

535.81 : 535.243 *see Abstr.* 142

535.81 : 535.41 *see Abstr.* 174

535.824.2 189

The development of the microscope objective. BENNETT, A. H. *J. Opt. Soc. Amer.*, 33, *p.* 543, *Oct.*, 1943.—Errata. [Abstr. 1950 (1943)].

536.2 190

The numerical solution of heat-conduction problems. EMMONS, H. W. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 607–615, *Aug.*, 1943.—The relaxation method for the solution of steady-state heat-conduction problems in 2 and 3 dimensions is given. The generalization of the graphical method for solving non-steady heat-flow problems is given.

536.21 : 548.0 : 537.226 191

Thermal conductivity of dielectrics at temperatures lower than that of Debye. POMERANCHUK, I. *J. Phys., USSR*, 6, 6, *pp.* 237–250, 1942.—A mathematical discussion is given of the dependence of the thermal conductivity of dielectrics on the temperature and on the impurities conc. at temperatures below the Debye temp. Under impurities are included chemical impurities, lattice defects, isotopes, etc. At the low temperatures considered, dielectrics possess the true thermal conductivity which only depends on the body dimensions within a narrow range of extremely low conc. of impurities. For high impurity conc. the thermal conductivity varies as $\sqrt{L}$, where L is a measure of the linear dimensions of the crystal. A temperature range exists where the thermal conductivity does not depend on temp. and this affords an explanation of the anomalous behaviour of the thermal conductivity of diamond. A. W.

536.212.2 : [546.78 + 546.883] : 537.312.6 *see Abstr.* 203

536.212.3 : 539.216 : 691.11 192

The effect of wood structure upon heat conductivity. WANGAARD, F. F. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 127–135, *Feb.*, 1943.—The differential thermal conductivity of wood in the longitudinal and transverse directions is due chiefly to the anisotropic character of the fibrils, and deviations from anticipated transverse-conductivity values, as well as longitudinal-transverse heat-conductivity ratios, are closely related to fibrillar orientation.

536.4 : 548.0 *see Abstr.* 313, 314

536.423.1 : 533.16 *see Abstr.* 117

536.423.8 : 532.62 *see Abstr.* 108

536.48 : 541.25 : 548.33 = 3 *see Abstr.* 317

536.495 : 678.77 193

Heat resistance of neoprene GN vulcanizates. FORMAN, D. B. *Industr. Engng Chem.*, 35, *pp.* 952–957, *Sept.*, 1943. E. R. A.

536.631 : 546.264 194

Specific heat of solid carbon dioxide. VENKATESWARAN, C. S. *Curr. Sci.*, 12, *pp.* 252–253, *Sept.*, 1943.—[See Abstr. 1675–1681 (1942)].

536.633.3 : 546.264 195

Specific heat ratios in CO_2. KATZ, L. *J. Chem. Phys.*, 11, *pp.* 496–497, *Oct.*, 1943.—[See Abstr. 1456 (1943)].

536.658 : 541.128.34 : 541.183.2 *see Abstr.* 307

536.658 : 541.183.25 196

The adsorption of water by jute. POWRIE, A., AND SPEAKMAN, J. B. *J. Text. Inst., Manchr*, 34, *pp. T77–T86, Oct.*, 1943.—Adsorption and desorption isotherms have been determined at 25°C. with 6 samples of jute, incl. 2 samples each of white jute of high and low quality, 1 sample of red jute and a sample of *Hibiscus cannabinus*. The adsorption isotherms, between which there is considerable hysteresis, are sigmoid in shape. Different kinds of jute differ in their affinity for water, and there is a tendency for the regain at any particular humidity to increase with increasing xylan + lignin content.

536.662 : 541.127 : 541.128.1 = 3 *see Abstr.* 286

536.7 : 541.123.2.034.6 197

The volume of mixing and the thermodynamic functions of benzene–carbon-tetrachloride mixture. WOOD, S. E., AND BRUSIE, J. P. *J. Amer. Chem. Soc.*, 65, *pp.* 1891–1895, *Oct.*, 1943.—The change of the thermodynamic functions on mixing at const. vol. were calculated from the change on mixing at const. pressure at 25°, 40° and 70°. The volume of mixing increases approx. 9-fold; the excess entropy of mixing at const. vol. decreases by ½ from 25° to 70°.

536.71 198

The pressure-volume-temperature relations of 2,2-dimethylbutane. FELSING, W. A., AND WATSON, G. M. *J. Amer. Chem. Soc.*, 65, *pp.* 1889–1891, *Oct.*, 1943.

536.71 : 546.217(083.5) 199

A table of thermodynamic properties of air. KEENAN, J. H., AND KAYE, J. *J. Appl. Mech.*, 10, *A123–A130, Sept.*, 1943.

536.758 : 678 : 539.31 *see Abstr.* 257

537.217 : 538.3 200

Note on the interaction of two point-charges. MILNE, E. A. *Phil. Mag.*, 34, *pp.* 712–716, *Oct.*, 1943.—A simplified version of the derivation of the integrals of "energy" and "angular momentum" for a pair of point-charges in the presence of each other, is given [Abstr. 1703 (1943)]. A. J. M.

537.226 : 548.0 : 536.21 *see Abstr.* 191

537.228.1 : 549.903 201

A mineral survey for piezo-electric materials. BOND, W. L. *Bell Syst. Techn. J.*, 22, *pp.* 145–152, *July*, 1943.

537.311.35 : 541.182.6 202

The electrical conductivity of colloids. BOLAM, T. R., AND TRIVEDI, A. K. M. *Trans. Faraday Soc.*, 39, *pp.* 247–253, *Sept.–Oct.*, 1943.—The electrical conductivity of Odén sulphur sols is anomalous: on dilution, the sp. conductivity decreases more rapidly than does the conc. While the free polythionate in

sulphur sols shows normal behaviour, strong interionic action occurs betw. the bound polythionate ions and their compensating oppositely charged ions. The equiv. conductivity of the bound polythionate increases with increase in sol conc.

537.312.6 : 536.212.2 : [546.78+546.883] 203

Thermal and electrical conductivities of tungsten and tantalum. Cox, M. *Phys. Rev.*, 64, *pp.* 241–247, *Oct.* 1 *and* 15, 1943.—An investigation was made of the variation with temperature of the resistance, thermal conductivity, and Wiedemann–Franz ratio, of wires suspended in vacuum and thermostated at 77°K., 90°K., 273°K. and 373°K. Limitations were found on the method, particularly lack of available data on the emissivity of Ta. An anomaly was observed in the variation with temperature of the resistance of Ta.

537.363 : 541.132.3 204

The electrophoretic behaviour of certain hydrocarbons and the influence of temperature thereon. Douglas, H. W. *Trans. Faraday Soc.*, 39, *pp.* 305–311, *Nov.*, 1943.—Electrophoretic-mobility *p*H curves were determined for dispersions of dodecane, paraffin wax and Δ^{1-2} octadecene. The affinity for hydroxyl ions of a hydrocarbon/water interface varies for different types of hydrocarbon. Calculation gave the heat of adsorption of hydroxyl ions as approx. 800 cals./g. ion of hydroxyl adsorbed.

537.523 : 621.3.015.5 : 537.564 *see Abstr.* 215

537.523.4 : 621.3.015.5 205

The channel of the spark discharge. Flowers, J. W. *Phys. Rev.*, 64, *pp.* 225–235, *Oct.* 1 *and* 15, 1943.—The spark discharge in air attempts to establish a channel in which the c.d. is const. (10^3 A/cm.^{2}). During the formation of the channel, which takes place by an expansion process producing a pressure or sound wave, the c.d. is much greater. Throughout most of the time, the light energy radiated is $\propto$ the current within the channel. The energy requirements for development are considered, and relations of these to the electrical circuits are discussed. The pilot-streamer theory of the lightning discharge is unsatisfactory by comparison with measured discharge characteristics, and the associated rôles assumed for diffusion and recombination processes in the spark discharge channel do not appear valid.

537.527.4 206

Afterglow in high-pressure gaseous discharges. Meek, J. M., and Craggs, J. D. *Nature, Lond.*, 152, *pp.* 538–539, *Nov.* 6, 1943.

537.531 : 535.4 207

The diffraction of X-rays by binary alloys. Smoluchowski, R. *Phys. Rev.*, 64, *pp.* 257–258, *Oct.* 1 *and* 15, 1943.

537.533.72 208

The shape of betatron pole faces. Bartlett, J. H. *Phys. Rev.*, 64, *p.* 185, *Sept.* 1 *and* 15, 1943.

537.533.73 209

Electron diffraction by large molecules. Storks, K. H. *Bell Lab. Rec.*, 21, *pp.* 390–393, *July*, 1943.—A short note on diffraction patterns of chain polymers, e.g. polyethylene sebacate, rubber, guttapercha.

E. R. A.

537.533.73 210

Electron diffraction. Thomson, G. P. *Mach. Mkt.*, *pp.* 383–384, *Sept.* 24, 1943.—The applications to the study of boundary lubrication, theory of polish, growth of crystals and formation of a compound on the surface of a crystal are examined.

M.-V.

537.533.74 : 535.14 211

A relativistic formula for the scattering of mesons under the influence of radiation damping. Ma, S. T. *Proc. Camb. Phil. Soc.*, 39, *pp.* 168–172, *Oct.*, 1943.—Exact solutions of the integral equations for the scattering of a positive meson by a neutron, and that of a negative meson by a proton are given. The results agree closely with those of the non-relativistic calculations [Abstr. 2402 (1941)].

A. J. M.

537.533.8 212

"Bremsstrahlung" of the particles with unit spin (mesotrons?). Smorodinsky, J. *J. Phys., USSR*, 6, 6, *pp.* 264–277, 1942.—The effective cross-section for the "Bremsstrahlung" of particles with unit spin is calculated by the method of retarded potentials, it being supposed that the energy of the particles is large compared with the rest energy of the mesotron. The applicability of the cross-section for large energies is considered. The effect of recoil and of the dimensions of the nucleus on the cross-section is calculated. The more precise formula of Christy and Kusaka [Abstr. 1077 (1941)] is discussed.

A. J. M.

537.534.8 : 537.591.1 213

On the production of mesons by proton-proton collisions. Heitler, W., and Peng, H. W. *Proc. Roy. Irish Acad. A*, 49, *pp.* 101–133, *Oct.*, 1943.—The rate of meson production is considered, using a theory of radiation damping recently proposed by the authors [Abstr. 2558 (1942)], and the analogous treatment of the electromagnetic field by Williams and by Weizsäcker [Abstr. 2876 (1934)]. The meson spectrum of a moving nucleon and the scattering of a meson by a nucleon are considered, and the results of these calculations are combined in the treatment of the production of mesons by collisions of two nucleons, and the energy loss of a nucleon.

A. J. M.

537.561 214

A laboratory experiment for determination of critical potentials. Fahey, D., and Winans, J. G. *Amer. J. Phys.*, 11, *pp.* 289–290, *Oct.*, 1943.

537.564 : 537.523 : 621.3.015.5 215

The electric breakdown and cumulative ionization. Davydov, B. *Phys. Rev.*, 64, *pp.* 156–158, *Sept.* 1 *and* 15, 1943.—Owing to cumulative ionization, in calculating the balance betw. impact ionization and recombination in a homogeneous electric field, 3 possible equilibrium values for the number of free electrons are obtained. This results in an S-like current/field-strength curve. The b.d. is interpreted as an abrupt transition from the lower to the upper branch. An expression for the b.d. field strength is obtained. In a certain region of current densities, no stable homogeneous solutions exist, and the current is concentrated in a narrow discharge canal.

537.565 216

A vector treatment of ionic motion through a gas in combined electric and magnetic fields. Rogers,

F. T., Jr. *Amer. J. Phys.*, 11, *pp.* 247–248, *Oct.*, 1943.

537.591 : 531.19 217

Statistical mechanics of processes observed in cosmic-ray phenomena. Wataghin, G. *Phys. Rev.*, 64, *p.* 248, *Oct.* 1 *and* 15, 1943.

537.591 : 539.16.08 *see Abstr.* 245

537.591.1 218

The multiple production of penetrating particles by cosmic-ray protons and neutrons. Hazen, W. E. *Phys. Rev.*, 64, *p.* 257, *Oct.* 1 *and* 15, 1943.—[See Abstr. 2834 (1943)].

537.591.1 : 537.534.8 *see Abstr.* 213

537.591.15 219

Note on large cosmic-ray bursts in an unshielded ionization chamber. Lapp, R. E. *Phys. Rev.*, 64, *pp.* 129–130, *Sept.* 1 *and* 15, 1943.—Large bursts recorded with an unshielded ionization chamber were coincident with extensive atmospheric showers detected with G.-M. counters. The bursts observed in the ionization chamber represent regions of very high particle density in an Auger shower. The integral size/frequency distribution curve is approximated by an inverse power law with exp. $2{\cdot}15 \pm 0{\cdot}35$.

537.591.15 220

Burst production in a gas volume. Sinha, M. *Phys. Rev.*, 64, *pp.* 248–249, *Oct.* 1 *and* 15, 1943.

537.591.15 221

The origin of large bursts under thick shields. Lapp, R. E. *Phys. Rev.*, 64, *pp.* 254–255, *Oct.* 1 *and* 15, 1943.

537.591.15 222

On the spin of the mesotron from burst measurements. Lapp, R. E. *Phys. Rev.*, 64, *pp.* 255–256, *Oct.* 1 *and* 15, 1943.

537.591.15 223

The effect of radiation damping on burst production. Kusaka, S. *Phys. Rev.*, 64, *pp.* 256–257, *Oct.* 1 *and* 15, 1943. [*See Abstr.* 2205 (1943)].

537.591.5 224

The multiple production of secondary cosmic-ray particles in the lower atmosphere. Regener, V. H. *Phys. Rev.*, 64, *pp.* 250–252, *Oct.* 1 *and* 15, 1943.

537.591.5 225

Absorption curve and production of slow cosmic-ray protons at low altitude. Regener, V. H. *Phys. Rev.*, 64, *pp.* 252–253, *Oct.* 1 *and* 15, 1943.

537.591.8 226

Production of secondaries in paraffin by primary cosmic-ray particles. Schein, M., Iona, M., Jr., and Tabin, J. *Phys. Rev.*, 64, *pp.* 253–254, *Oct.* 1 *and* 15, 1943.

538.2 227

Effect on B/H curves of electric currents through a transformer core. Sarna, H. R., Kalia, P. N., and Jai Dyal Dhingra. *Curr. Sci.*, 12, *pp.* 251–252, *Sept.*, 1943.

538.2 : 669.24 = 3 228

Magnetic investigation of a nickel-carbon alloy. Gerlach, W., and Rennenkampff, J. von. *Z. Elektrochem.*, 49, *pp.* 200–203, *April–May*, 1943.—Study of the anomalous magnetic behaviour of Ni saturated with C. E. R. A.

538.21 229

Coercive force. Howe, G. W. O. *Wireless Engr*, 20, *pp.* 469–472, *Oct.*, 1943.—In the case of ordinary iron and steel, the difference between the two definitions—reversed magnetic force required to reduce B to zero after magnetizing, and reversed magnetic force required to reduce the intensity J to zero—is immaterial, but for some alloys the difference is considerable. Figures are given for the alloy used by Faus and Macintyre for the magnets of their moving-magnet d.c. instrument. This alloy has a coercive force (J to zero) of 6 000 oersteds and a residual induction of 610 gauss. Discussion shows that for all ordinary purposes the lower figure is the correct measure of the suitability of the material for use as a permanent magnet, but the higher figure is concerned with the ability of the material to withstand extraneous temporary demagnetizing forces. A. W.

538.214 230

The magnetic susceptibilities of metals dissolved in liquid ammonia. Freed, S., and Sugarman, N. *J. Chem. Phys.*, 11, *pp.* 354–360, *Aug.*, 1943.—Data for K and Cs, and a few data for Ca and Ba, dissolved in liquid NH_3 at 240° and 220°K., are reported. The solutions are regarded as representing an electron gas, the general features of the magnetic behaviour being overlaid by interactions characteristic of the environment of the electrons in the solutions. From the results, a description is proposed for the structure of the solutions with special reference to the conduction electrons. N. M. B.

538.214 231

The magnetic susceptibility of oxygen and nitric oxide at low field strengths. Burris, A., and Hause, C. D. *J. Chem. Phys.*, 11, *pp.* 442–445, *Oct.*, 1943.—The Rankine magnetic balance was used to determine the magnetic susceptibility of O_2 and NO at atm. pressure in a field of 15 oersteds.

538.3 : 537.217 *see Abstr.* 200

538.566 : 621.396.616 = 3 232

Elementary theory of the spherical-cavity resonator. Berg, T. G. O. *Hochfrequenztechn. u. Elektroakust.*, 57, *pp.* 56–60, *Feb.*, 1941.—Expressing Maxwell's equations in spherical co-ordinates and assuming the radial component of the magnetic field strength = 0, solutions are found for the space inside the spherical resonator, in the metallic envelope and outside the sphere, under simplifying boundary conditions, e.g. finite values of electric and magnetic fields and steady variation of their angular components along the surface of the envelope. R. N.

538.615 : 546.29 : 535.338.3 *see Abstr.* 152

538.662.13 : 539.132 *see Abstr.* 237

538.662.13 : 548.0 233

On the theory of phase transitions of the second order. II. Phase transitions of the second order in alloys. Lifshitz, E. M. *J. Phys., USSR*, 6, 6, *pp.* 252–263, 1942.—An examination is made of the possible existence of phase transitions in alloys; and tables are given of all possible superstructures (in face-centred and body-centred cubic, and hexagonal close-packed lattices) for which such transitions are possible. J. T.

538.7 : 527(09) 234

Some early contributions to the history of geomagnetism. IV. HARRADON, H. D. *Terr. Magn. Atmos. Elect.*, 48, *pp.* 127–128, *Sept.*, 1943.—Translation of and comments on Hartmann's letter (1544) describing his observations of declination and dip. [See Abstr. 2579 (1943)].

539.132 235

The forces between hydrogen molecules. MARGENAU, H. *Phys. Rev.*, 64, *pp.* 131–147, *Sept.* 1 *and* 15, 1943.—The forces consist of exchange, quadrupole and dispersion (van der Waals) forces. By compounding these, it is possible to account for the size and the shape of the molecules. The interaction curves agree with empirical curves derived from second-virial coefficients. A simple state function of the Wang type was used to represent the charge distribution within the molecule. Quadrupole moments are computed and comments are made on the relation betw. the molecular problem and the atomic problem (interaction betw. He atoms).

539.132 236

Momentum distribution in molecular systems. VII. Momentum distribution and shape of the Compton line for Li_2 and N_2. DUNCANSON, W. E. *Proc. Camb. Phil. Soc.*, 39, *pp.* 180–188, *Oct.*, 1943.—The choice of wave function for the computation is discussed. The mean radial momentum distributions and the Compton profiles were compared when various types of wave function were used. There is some discrepancy between theoretical and experimental values of the half-width of the Compton profiles, which might be bridged if a better wave function were used. [See Abstr. 2408 (1941), 505 (1942)]. A. J. M.

539.132 : 538.662.13 237

Statistics of two-dimensional lattices with four components. ASHKIN, J., AND TELLER, E. *Phys. Rev.*, 64, *pp.* 178–184, *Sept.* 1 *and* 15, 1943.—A 2-dimensional square net consisting of 4 kinds of atoms is considered, supposing that only nearest neighbours interact and that there are only 2 distinct potential energies of interaction, one betw. like and one betw. unlike atoms. Where like atoms attract one another a simple reciprocity relation exists betw. the partition functions at pairs of temperatures reciprocally related to one another. Assuming that only 1 Curie transition point exists, the Curie temperature can be located.

539.133 : 541.571.5 238

Hyperconjugation in methyl butadienes as shown by dipole moments. HANNAY, N. B., AND SMYTH, C. P. *J. Amer. Chem. Soc.*, 65, *pp.* 1931–1934, *Oct.*, 1943.—The permittivities of the vapours of butadiene, 1-methyl-, 2-methyl- and 2,3-dimethylbutadiene were measured and used to calculate the dipole moments of the molecules. The molecules are largely in a *cis* form with resp. to the central C–C bond. The moment values support the theory of hyperconjugation. [Abstr. 1466 (1943)].

539.155.2 : 523.873 *see Abstr.* 65

539.156 239

The hydrogen atom and the classical theory of radiation. ELIEZER, C. J. *Proc. Camb. Phil. Soc.*, 39, *pp.* 173–179, *Oct.*, 1943.—Considers the application of Dirac's classical theory of radiating electrons to the straight-line motion of an electron towards a fixed proton and the straight-line motion of 2 oppositely charged electrons. The paper also discusses the probable solutions in 2- and 3-dimensional motions of an electron moving round a fixed proton. There appears to be no solution which would permit a collision between the two particles.

539.16.08 240

A self-stabilized high-voltage source for Geiger counters. AIYA, S. V. C. *Curr. Sci.*, 12, *p.* 227, *Aug.*, 1943.—[See Abstr. 1341 (1939)].

539.16.08 241

Soft-radiation Geiger counter. WELTIN, H. *Rev. Sci. Instrum.*, 14, *p.* 278, *Sept.*, 1943.—[See Abstr. 2848 (1943)].

539.16.08 242

A double ionization chamber for electrometers. HIBDON, C. T. *Amer. J. Phys.*, 11, *pp.* 286–289, *Oct.*, 1943.

539.16.08 243

Stable self-quenching Geiger–Müller counters containing organo-metallic compounds. KESTON, A. S. *Rev. Sci. Instrum.*, 14, *pp.* 293–295, *Oct.*, 1943.—Stable self-quenching counters may be prepared by filling counter tubes with tetramethyl lead vapour at 2 cm. pressure. The counters are characterized by wide usable voltage ranges and show wide voltage ranges where the count is practically independent of voltage.

539.16.08 244

The factors influencing the plateau characteristics of self-quenching Geiger–Müller counters. SPATZ, W. D. B. *Phys. Rev.*, 64, *pp.* 236–240, *Oct.* 1 *and* 15, 1943.—Impurities (air or O_2) increase the plateau slope and starting potential of argon-alcohol counters. Operation of the counter causes changes in plateau characteristics: (*a*) Immediately after use, the plateau slope increases slightly; (*b*) with continued use the slope becomes steeper; (*c*) for moderate use the counter recovers when inactive, but never to the original characteristics; (*d*) with further use, the counter loses its plateau and does not recover; (*e*) the pressure in an argon-alcohol counter increases as a function of the total number of counts recorded.

539.16.08 : 537.591 245

A hydrostatically supported cloud chamber of new design for operation at high pressures. JOHNSON, T. H., DEBENEDETTI, S., AND SHUTT, R. P. *Rev. Sci. Instrum.*, 14, *pp.* 265–271, *Sept.*, 1943.—A medium-sized cloud chamber is described in which the pressure is sustained by the walls of an oil-filled steel container. The chamber is designed to operate at 200 atm. When filled at this pressure with argon, the gas has a stopping power for cosmic rays equiv. to 80 m. of the atmosphere.

539.16.08 : 544.83 246

Radioactive mercury in mercury-vapour measurements. IRVINE, J. W., JR., AND GOODMAN, C. *J. Appl. Phys.*, 14, *pp.* 496–498, *Sept.*, 1943.—Radioactive Hg^{197} was prepared by deuteron bombardment of gold. This isotope was used as a tracer to establish an average concentration of 0·01 mg. Hg per m.^{3} of air in a particular industrial operation

suspected of causing chronic mercurialism. Mercury in quantities of 10^{-8} g. was detected.

539.163.2 247

The energies of the γ-rays from radioactive scandium, gallium, tungsten and lanthanum. MANDEVILLE, C. E. *Phys. Rev.*, 64, *pp.* 147–150, *Sept.* 1 *and* 15, 1943.—The energies were determined by semicircular focusing of Compton recoils in a magnetic spectrograph. The 2 quanta emitted in the disintegration of Ga^{72} are present with equal intensity, which suggests that they may be in cascade. The γ-ray activity of Ga^{72} was followed for 100 hr. and found to decay with a ½-period of $(14{\cdot}25 \pm 0{\cdot}20)$ hr.

539.163.2 248

The coincidence method and its applications to disintegration problems. NORLING, F. *Ark. Mat. Astr. Fys.*, 27*A*, 4, *No.* 27, [95 *pp.*], 1941.—Problems concerning coupling effects in the disintegration of radioactive nuclei are investigated by coincidence counting. The efficiencies of different counters are measured for γ rays of different wavelengths. The β- and γ-level schemes involved in the disintegration of As^{76}, Mn^{56} and Au^{198} are analysed by carrying out β–γ and γ–γ coincidence measurements with different absorbing filters. The extent of deformation of the β spectrum by secondary electrons is estimated by β–β coincidence measurements using β counters with very thin windows. A. HU.

539.163.2 : 546.86 249

The beta-ray spectrum of antimony (124). HALES, E. B., AND JORDAN, E. B. *Phys. Rev.*, 64, *pp.* 202–206, *Oct.* 1 *and* 15, 1943.—The continuous β-ray spectrum of Sb^{214} was investigated with a 180° type of spectrometer. The spectrum consists of 2 components, the end points of which are $(0{\cdot}74 \pm 0{\cdot}03)$ eMV and $(2{\cdot}45 \pm 0{\cdot}07)$ eMV. The difference agrees with the value of the hard γ-ray from Sb^{214}. Internal conversion lines, due to decay of a long-lived Te isotope in the source were observed, corresp. to γ-ray energies of 0·23 eMV and 0·61 eMV. A possible energy-level scheme is discussed.

539.17 250

Further measurements on the disintegration curve of mesotrons. NEREson, N., AND ROSSI, B. *Phys. Rev.*, 64, *pp.* 199–201, *Oct.* 1 *and* 15, 1943.—[See Abstr. 735 (1943)]. A set of data gives a mean lifetime of $(2{\cdot}15 \pm 0{\cdot}07)$ μsec. as calculated from the differential disintegration curve.

539.215 251

Rugosity of granular solids. ROBERTSON, R. H. S., AND EMÖDI, B. S. *Nature, Lond.*, 152, *pp.* 539–540, *Nov.* 6, 1943.

539.215.5 : 541.128.3 *see Abstr.* 289

539.216 : 541.68 *see Abstr.* 312

539.216 : 691.11 : 536.212.3 *see Abstr.* 192

539.216.1 252

Electron microscope studies of the capture of air-borne particles by single fibres. BURTON, E. F. *Nature, Lond.*, 152, *p.* 540, *Nov.* 6, 1943.

539.24 : 669.14 253

A note on the microstructure of high-silicon acid-resisting iron. HURST, J. E., AND RILEY, R. V. *J. Iron Steel Inst.*, [4 *pp.*], 1943. *Advance copy.*—An unusual type of etched (barley shell) structure is observed in commercial Fe-Si alloys containing upwards of 10% of Si. It is obtained by etching with a reagent containing picric and hydrofluoric acids.

539.26 : 778.3 254

The dependence of photographic sensitivity on X-ray quality. SMITH, E. E. *Photogr. J.*, 83, *pp.* 303–306, *Aug.*, 1943.—Discusses the specification of an X-ray beam by both quality and quantity, and explains why, if photographic film is used to measure X-ray dosage, a knowledge of the quality of the beam is necessary. Without this, the results may be in error by a large factor depending on the exciting voltage on the X-ray tube. J. T.

539.266 : 546.17 255

Atomic and electronic distributions in liquid nitrogen, nitric oxide and nitrous oxide. SHARRAH, P. C. *J. Chem. Phys.*, 11, *pp.* 435–441, *Oct.*, 1943.—The monochromatic X-ray patterns for liq. N_2, NO and N_2O were obtained and analysed by the Fourier integral method. The patterns show 1 main peak and faint peaks or plateaus at larger angles. The distribution curves show diatomic aggregates in liq. N_2 and NO comparable to those found in the gaseous states.

539.31 256

The elasticity of a network of long-chain molecules. II. TRELOAR, L. R. G. *Trans. Faraday Soc.*, 39, *pp.* 241–246, *Sept.–Oct.*, 1943.—Wall's treatment [Abstr. 2869 (1942)] is extended to cover the homogeneous type of deformation of rubber. An equation is derived for the work of deformation in terms of the 3 principal strains, from which general stress/strain relations are deduced. These involve only 1 physical const. of the material. The effective rigidity in resp. of a shear in a place $\perp$ a previous elongation is $\propto$ to $(\text{elongation})^{-1}$. [See Abstr. 906 (1943)].

539.31 : 531.23 *see Abstr.* 86

539.31 : 535.55 *see Abstr.* 182

539.31 : 536.758 : 678 257

Theory of the elastic properties of rubber. JAMES, H. M., AND GUTH, E. *J. Chem. Phys.*, 11, *pp.* 455–481, *Oct., and p.* 531, *Nov.*, 1943.—The structure of bulk rubber in the lightly vulcanized state consists of a coherent network of flexible molecular chains, with other molecules acting like a fluid mass in which the network moves with Brownian motion. Rubber is distinguished by its long-range elasticity and the unusual S-form of its stress/strain curves. The knee in these curves is due to change in internal pressure in the material. Crystallization may enhance the S-shape in natural rubber, but does not occur in synthetic rubber. When rubber is extended under const. load and heated, it contracts; when kept at const. length, rise of temperature increases the stress. The thermoelastic properties are worked out and explained. Rubber has properties which cause it to behave like a solid, liquid and gas. The paper describes models of the structure of rubber and calculates their entropies and the associated forces. G. E. A.

539.384 : 678 : 620.177 258

Heat generation in flexed rubber. GEHMAN,

S. D., JONES, P. J., AND WOODFORD, D. E. *Industr. Engng Chem.*, 35, *pp.* 964–971, *Sept.*, 1943. E. R. A.

539.384.4 259

A critical review of the C.S.I.R. timber-column formula. MORELLI, D. A. *J. Instn Engrs, Aust.*, 15, *pp.* 135–139, *June*, 1943.—The gradual permanent set developed in timber when under load for a prolonged period is discussed; some controversial points in a timber-column formula published by the Council for Scientific and Industrial Research are criticized. In the discussion it is pointed out that defects in the author's mathematical reasoning invalidate the proposed solution, and that theory and experiment show that the strength of long timber columns is less for loads of long duration than for short-time loads.

G. E. A.

539.386.08 260

Ring method for measuring elastic moduli. KING, A. *Rev. Sci. Instrum.*, 14, *pp.* 33–34, *Feb.*, 1943.—The theory of the ring method for measuring shear moduli of wire specimens is developed. Measurements on the same wire samples of Cu and Mo by the torsion pendulum and ring methods check within exp. errors. E. R. A.

539.4.016 261

The strength of cylindrical dies. SACHS, G., AND LUBAHN, J. D. *J. Appl. Mech.*, 10, *A*147–*A*155, *Sept.*, 1943.—Internal-pressure tests on hot-rolled- and cold-rolled-steel cylinders yield pressure/expansion curves of the same shape as those determined mathematically. The value of the flow stress can be determined by finding the theoretical pressure/expansion curve which most nearly fits the data. Values of flow stress determined in this way agree with the yield strength found from a tensile test. Die-steel cylinders, heat-treated to hardnesses up to 62 Rockwell C, exhibit plastic flow before failure, and the stress/strain curve permits the calculation of the flow stress by this method. The flow stress increases with the hardness.

539.4.016 : 666 262

The effect of shape on the thermal endurance of cylindrical glass containers. MURGATROYD, J. B. *J. Soc. Glass Technol.*, 27, *pp.* 77–93(*T*), *June*, 1943.—Theoretical investigations on the effect of shape on the stress systems set up by thermal gradients are discussed and the results applied to the problem of the thermal endurance of cylindrical glass containers. The stress systems at the mouth of a container and at the junction of cylinder and base are considered.

539.4.019 263

Metals at high temperatures. BRUYNE, N. A. DE. *Aircr. Engng*, [4 *pp.*], *Aug.*, 1943.—A theory is developed based on the assumption that the strain energy at rupture reduces the energy of activation of the flow process, and the theory is shown to be in numerical agreement with the experimental results, if the energy of activation of the flow process is about $\frac{1}{3}$ of the lat. ht. of evaporation per g. atom. Values of the cohesive strengths and of the stress concentration factors are derived.

539.4.019 264

The effect of absorption of water on the mechanical properties of sandstones. JAEGER, J. C. *J. Instn Engrs Aust.*, 15, *pp.* 164–166, *July*, 1943.

539.4.019.1 : 679.5 265

The fast and slow extension of some plastic materials. HAWARD, R. N. *Trans. Faraday Soc.*, 39, *pp.* 267–280, *Nov.*, 1943.—[See Abstr. 2902 (1942)]. The work taken up by any material under impact may be governed by the rate at which deformation can take place or by the amount of possible deformation. The results of fast and slow extension experiments are examined. Experiments are carried out on the extension and breaking of cellulose acetate film at different temperatures and it is concluded that temperature changes during adiabatic extension will not alter the character of the deformation. The work absorption of different materials under changing conditions of testing varies both relatively and absolutely, and the validity of a generalized impact strength is questioned.

539.43 : 679.5 : 669 266

Some mechanical properties of plastics and metals under sustained vibrations. LAZAN, B. J. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 87–104, *Feb.*, 1943.—An oscillatory type testing machine was developed for determining the mechanical properties of materials under alternating torsional stress. The damping capacity and dynamic modulus of rigidity of plastics and metals were evaluated and studies are reported of how these properties are affected by sustained cyclic stress below the endurance limit and at impending fatigue failure. A similar dynamic testing machine was built for applying alternating direct stress, and parallel studies were made under axial loading conditions. The mechanical properties of selected materials in static tension, compression and torsion were determined. The wide deviations betw. static and dynamic moduli of elasticity for plastics are analysed. Experimental data on the damping capacities, dynamic moduli of elasticity and static mechanical properties, are presented for mild steel, duralumin, grade X laminated bakelite, laminated-canvas phenolic, and methyl-methacrylate plastic. [See Abstr. 2593 (1943)].

539.434 : 666.97 267

Creep and shrinkage in plain, reinforced, and pre-stressed concrete. A general method of calculation. ROSS, A. D. *J. Instn Civ. Engrs*, 21, *pp.* 38–57, *Nov.*, 1943.

539.501 : 677.46 268

Flow and recovery properties of viscose rayon yarn. PRESS, J. J. *J. Appl. Phys.*, 14, *p.* 464, *Sept.*, 1943.—Errata. [Abstr. 2228 (1943)].

539.56 : 678 269

Bend-brittle and shatter points of rubber-like materials. KING, G. E. *Industr. Engng Chem.*, 35, *pp.* 949–951, *Sept.*, 1943.

539.6 270

Ploughing and adhesion of sliding metals. BIKERMAN, J. J. *J. Appl. Phys.*, 14, *p.* 436, *Aug.*, 1943.—[See Abstr. 1737 (1943)].

541.123.2.034.6 : 536.7 *see Abstr.* 197

541.124 271

The influence of alkylation on the reactions of acid derivatives in the Friedel–Crafts synthesis. ROTHSTEIN, E., AND SABOOR, M. A. *J. Chem. Soc.*, *pp.* 425–429, *Sept.*, 1943.—When acids or their chlorides or anhydrides are treated with reagents,

(1) their reactions yield ketones (under Friedel–Crafts conditions) or ketones and CO_2; or (2) tertiary acids eliminate CO and the product is an unsaturated substance or its polymeride. These reactions are discussed and a mechanism is suggested. A new application of the Friedel–Crafts synthesis is described.

541.124 : 532.133 *see Abstr.* 100

541.124 : 541.57 272

Rates and equilibria in the ionization of C–H bonds. BELL, R. P. *Trans. Faraday Soc.*, 39, *pp.* 253–259, *Sept.–Oct.*, 1943.—Data have been collected for the rates of ionization of 12 ketones in presence of bases, and for the dependence of the rate of ionization on basic strength. Approx. values for the acid dissociation constants are deduced. The effect of substituents on the acid strengths of ketones is discussed in terms of inductive and mesomeric effects. An attempt is made to estimate the conc. of unassociated water molecules in liq. water. In the reaction $SH + B^- \rightleftharpoons BH + S^-$ (where SH is a ketone) the effect upon the reaction velocity of substituents in either SH or B^- can be expressed uniquely in terms of their effect upon the equilibrium const. of the reaction.

541.124 : 541.636 273

Steric factors in quaternary salt formation. BROWN, W. G., AND FRIED, S. *J. Amer. Chem. Soc.*, 65, *pp.* 1841–1845, *Oct.*, 1943.

541.124.7 274

The induced chlorination of maleic acid. Evidence for chain-reaction mechanisms. TAUBE, H. *J. Amer. Chem. Soc.*, 65, *pp.* 1876–1882, *Oct.*, 1943.—One-electron reducing agents which react with Cl_2 and Ce^{+4}, are equally effective as inductors, those which do not react rapidly with Cl_2 are effective as inhibitors of the induced reaction. O_2 is an efficient inhibitor. These results, and the kinetics of the process, are explained by a chain mechanism involving Cl and an organic free radical.

541.124.7 : 541.134 : 532.739.2 *see Abstr.* 112

541.124.7 : 546.262.3 : 535.338.42 *see Abstr.* 155

541.126 : 615.78 275

Explosion hazards of combustible anaesthetics. JONES, G. W., KENNEDY, R. E., AND THOMAS, G. J. *Techn. Pap. U.S. Bur. Min., No.* 653, [47 *pp.*], 1943.—This report summarizes the laboratory and clinical investigations carried out rel. to the inflammability of gaseous anaesthetic mixtures. The factors that contribute to the explosion hazards in anaesthesia are discussed. The laboratory investigations deal with the ignition temperatures of combustible anaesthetics in air and O_2, and their limits of inflammability in air, O_2 and N_2O; also with the inflammability of a wide range of anaesthetic mixtures. The results are set out in curves showing the area of inflammability of all possible mixtures of the gases considered. Emphasis has been placed on the procedure of adding He to the inflammable anaesthetic mixtures in amounts sufficient to reduce the O_2 content to the point where the mixtures are outside the inflammability range. The method used in sampling and determining the explosibility of the anaesthetic mixtures is described.

A. E. T.

541.127 276

Reactions of hydrazoic acid. II. A quantitative study of the action with substituted benzoic acids. BRIGGS, L. H., AND LYTTLETON, J. W. *J. Chem. Soc.*, *pp.* 421–425, *Sept.*, 1943.—The rate of reaction of the substituted benzoic acids as determined by the time of $\frac{1}{2}$ the evolution of N is in the reverse order of their strength as acids measured by the dissociation constants, with the exception of *o*-nitrobenzoic acid where an "ortho-effect" is observed. The total yield of N evolved and the yield of amine produced do not bear any similar relation.

541.127 277

Kinetics of the oxidation of organic compounds by potassium permanganate. VI. Benzaldehyde. TOMPKINS, F. C. *Trans. Faraday Soc.*, 39, *pp.* 280–287, *Nov.*, 1943.—In neutral solution the reaction is kinetically of the 2nd order, with a velocity const. of 0·34 l./g. mol./sec. at 30·30°C. and an activation energy of 11 800 cal. in the range 26·70°–45·63°C. In alkaline solution the bimolecular rate const. (k) falls with time, but the extrapolated values for zero time (k_0) increase linearly with the OH′ conc. up to 0·15 *N*, when an additional acceleratory effect due to manganate formation is observed. The hydroxyl ion reacts with the aldehyde to form the aldehyde ion which is more rapidly oxidized than the molecule. In acid solution, k increases with time and k_0 depends solely on the H ion conc. This is interpreted in terms of the theory of apparent oxidation potential.

541.127 278

The denaturation of tobacco mosaic virus by urea. II. Kinetic aspects. LAUFFER, M. A. *J. Amer. Chem. Soc.*, 65, *pp.* 1793–1802, *Oct.*, 1943.—The sp. reaction velocity is increased by the addition of small quantities of salt and is depressed by the addition of larger quantities of electrolyte. The sp. reaction vel. is a linear function of the reciprocal of the initial virus conc. and varies in a complex way with changes in temperature. This is explained by assuming that the denaturation can proceed by several parallel reactions, some with neg., some with pos., differential rate/temp. coefficients. In the reactions with neg. coefficients the $\triangle H$ values of the equilibrium reactions are $>$ the energies of activation of the denaturation steps, while in the reactions with the pos. coefficients the opposite is true.

541.127 : 536.662 : 541.128.1 = 3 *see Abstr.* 286

541.127 : 541.182.046 *see Abstr.* 303

541.127.1 279

The halogenation of phenolic ethers and anilides. XIV. *m*-substituted phenyl ethers. JONES, B. *J. Chem. Soc.*, *pp.* 430–432, *Sept.*, 1943.—Velocity coeff. for the chlorination of aromatic ethers (m-C_6H_4X . OR) and for certain disubstituted ethers are recorded.

541.127.1 280

Studies in blue perchromic acid. I. Kinetics of the decomposition of the blue perchromic acid in various organic media. PRAKASH, S., AND RAI, R. C. *Proc. Indian Acad. Sci. A*, 18. *pp.* 1–7, *July*, 1943.—The decomposition kinetics was studied under varying conditions. The reaction is monomolecular. The values of log K *v.* $1/T$ give a straight line, showing that Arrhenius's equation is valid. The rate of decom-

position is increased in the presence of benzene, toluene and xylene.

541.127.2 281

The kinetics of the decomposition of trinitrobenzoic acid in dioxane–water mixtures. TRIVICH, D., AND VERHOEK, F. H. *J. Amer. Chem. Soc.*, 65, *pp.* 1919–1924, *Oct.*, 1943.—The order of reaction changes continuously from 1 in solutions of low dioxane content to ½ in solutions of high dioxane content. The reaction rate has a max. at 60% dioxane. The variation in the order of the reaction and the max. in the reaction rate are explained as due to the decomposition of the trinitrobenzoate ion.

541.127.2 : 541.128 *see Abstr.* 282

541.128 : 541.127.2 282

Rates and temperature coefficients of the hydroxyl-ion-catalysed aldol condensation of benzaldehyde with methyl ethyl ketone and acetone. GETTLER, J. D., AND HAMMETT, L. P. *J. Amer. Chem. Soc.*, 65, *pp.* 1824–1829, *Oct.*, 1943.—Kinetically, the base-catalysed reaction is first-order with resp. to the conc. of both aldehyde and ketone. The sp. rate is linear in but not $\propto$ the sq. root of the analytically determinable conc. of the base. Medium effects are pronounced and the sp. rate exhibits a parallelism to the initial conc. of either reactant.

541.128 : 541.45 283

The Brönsted relation in the hydrolysis of the halogenoacetates and the theory of acids and bases. SMITH, G. F. *J. Chem. Soc.*, *pp.* 521–523, *Nov.*, 1943.—The hydrolysis of the chloroacetate ion is subject to general basic catalysis, and the Brönsted catalysis relation holds for a series of basic catalysts, although important exceptions are noted. The bearing of these results on the theory of acids and bases is discussed.

541.128 : 577.15.02 284

The kinetics of enzyme inactivation. HOUSEHOLDER, A. S., AND GOMORI, G. *Bull. Math. Biophys.*, 5, *pp.* 83–90, *Sept.*, 1943.—The hydrolysis of β-glycerophosphate catalysed by a group of different enzyme extracts, with and without the addition of Mg, with and without preincubation of the enzyme, was studied and the results are discussed. Two distinct and independently acting constituent enzymes—or "principles" of the same enzyme—are present, one acting more rapidly, but more rapidly inactivated, than the other. Storage in refrigerator changes the behaviour of both constituents. In some cases an enzyme is limited in its hydrolytic capacity, i.e. after an enzyme molecule has decomposed a number of substrate molecules it becomes passive. In the case of one extract, the rôles of catalytically more and less active constituents in the absence of Mg are reversed in its presence. A damped periodicity is found which indicates the presence of 2 factors which influence and are influenced by the inactivation of the enzyme.

541.128.1 285

Catalytic dehydrogenation. I. Catalytic conversion of alcohols into aldehydes, paraffins and olefins. BADIN, E. J. *J. Amer. Chem. Soc.*, 65, *pp.* 1809–1813, *Oct.*, 1943.—Primary aliphatic alcohols have been catalytically converted by Raney Ni in the liquid phase to aldehydes, unsaturated hydrocarbons, and saturated hydrocarbons. Temperatures of 140°–275° were studied and the amount of catalyst was 5%. The reaction probably proceeds by dehydrogenation, deformylation and hydrogenation, the extent to which each reaction occurs being influenced by temperature and time.

541.128.1 : 541.127 : 536.662 = 3 286

Kinetics of the catalytic combustion of carbon monoxide in the presence of cupric oxide. Absolute calculation of catalytic reaction velocities. SCHWAB, G. M., AND DRIKOS, G. *Z. phys. Chem. B*, 52, *pp.* 234–252, *Oct.*, 1942.—The reduction of the CuO determines the velocity of the catalytic effect. A kinetic method of calculation leads to values for the adsorption coeff. of the same order as does the usual static method. The velocity constants are calculated under 2 different assumptions and identical values obtained. These lead to the explanation that the surface of the catalyst is slightly roughened and that the reaction requires 21 kcal. as activation heat of the gas molecules under the assumption of 3–4 deg. of freedom of the oscillating system CO-CuO. R. N.

541.128.24 287

Oxidation processes. XVI. The autoxidation of ascorbic acid. WEISSBERGER, A., LUVALLE, J. E., AND THOMAS, D. S., JR. *J. Amer. Chem. Soc.*, 65, *pp.* 1934–1939, *Oct.*, 1943.—[See Abstr. 2896 (1943).]—The autoxidation of *l*-ascorbic acid is investigated betw. *p*H 4·7 and 9·2 in the presence of cyanide and thiocyanate, to suppress the catalytic action of metals. The reaction obeys the first-order law with resp. to ascorbic acid. Both the singly and the doubly charged anions enter into reaction. The reaction rate of the doubly charged ion is $\propto$ the partial pressure of the oxygen; that of the singly charged ion is independent of oxygen pressure. The rate of copper-catalysed oxidation is $\propto$ the 0 conc. in the neutral and acid regions.

541.128.3 288

The oxygenation of crotonaldehyde. OWEN, L. N. *J. Chem. Soc.*, *pp.* 463–468, *Oct.*, 1943.—A quantitative study is made of the absorption of O_2 by crotonaldehyde in the presence of various catalysts. In acetic acid solution, there is an optimum conc. of Co or Mn at which oxygenation is most efficient, but Cu is ineffective at any conc. In the absence of a solvent, Co and Mn are detrimental, whereas Cu again has little effect. Crotonic acid is obtained in highest yield by the use of pure crotonaldehyde in the absence of any catalyst, precautions being taken against undue rise in temperature.

541.128.3 : 539.215.5 289

Relationship between particle size and efficiency of palladium-polyvinyl alcohol (Pd-PVA) catalysts. RAMPINO, L. D., KAVANAGH, K. E., AND NORD, F. F. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 246–256, *Aug.*, 1943.—Co-ordination of measurements of H absorption, rates of hydrogenation and determination of the size and shape of catalyst particles, shows that the preponderance of catalytic activity is associated with the Pd particles of smaller size. The superiority of the synthetic polymer-supported catalyst over the gum-arabic type appears to be due to an additional quality factor independent of particle size. N. M. B.

541.128.34 : 536.658 : 541.183.2 *see Abstr.* 307

541.132 : 532.7 : 535.324.2 290

Ion-solvent interaction and individual properties of electrolytes. FAJANS, K., AND JOHNSON, O. *Trans. Electrochem. Soc.*, 82, *pp.* 273–287, 1942.—Experimental data on the individual behaviour of mono-monovalent electrolytes in respect to conc. dependence of osmotic coeffs., apparent molar refraction and apparent molar vol. are discussed with ref. to the structure of ions and the solvent water. Factors especially responsible for the individual behaviour of strong electrolytes in aq. solution are: (1) the resultant of the forces betw. neighbouring ions and the forces betw. ions and the solvent; (2) the interaction betw. free ions and the solvent; (1) predominates at higher, and (2) at lower conc. Refractometric data show the existence, in aq. solutions of strong electrolytes, of combinations of oppositely charged ions without water mols. between them.

N. M. B.

541.132 : 532.739.2 291

The ionization constant of carbonic acid in water and the solubility of carbon dioxide in water and aqueous salt solutions from 0 to 50°. HARNED, H. S., AND DAVIS, R., JR. *J. Amer. Chem. Soc.*, 65, *pp.* 2030–2037, *Oct.*, 1943.—The solubility of CO_2 in water and aq. NaCl solutions from 0 to 50° was measured by analysing the solution in cells employed for the e.m.f. measurements. The log. of the dissociation constants were expressed by a least-square equation. The thermodynamic quantities for the dissociation were calculated from this equation.

541.132 : 535.375.5 292

The ionization of strong electrolytes. I. General remarks, nitric acid. REDLICH, O., AND BIGELEISEN, J. *J. Amer. Chem. Soc.*, 65, *pp.* 1883–1887, *Oct.*, 1943.—The degrees of ionization of HNO_3 were determined [see Abstr. 228 (1942), 1293 (1941), 3197 (1940). The thermodynamic ionization const. is $K = 21$.

541.132 : 541.133 293

The determination of dissociation constants of monobasic acids. II. The extrapolation method. III. The strengths of some cyano-acids. IVES, D. J. G., AND SAMES, K. *J. Chem. Soc.*, *pp.* 511–517, *Nov.*, 1943.—An extrapolation method previously proposed is shown to apply to conductivity measurements, and to provide an accurate interpolation equation for the determination of cell constants. The use of benzoic acid is recommended as the std. electrolyte. Thermodynamic dissociation constants of cyano-substituted carboxylic acids were measured by the conductivity method. The results are considered in relation to the structure of the cyano-acids and are correlated with existing data on the influence of substituents on acid strength. A connection betw. the dipole moment of the substituent and the dissociation const. of the acid is proposed.

541.132.3 : 537.363 *see Abstr.* 204

541.132.3 : 541.25 : 541.64 294

The effect of *p*H changes upon some of the properties of sodium thymonucleate solutions. VILBRANDT, C. F., AND TENNENT, H. G. *J. Amer. Chem. Soc.*, 65, *pp.* 1806–1809, *Oct.*, 1943.—[See Abstr. 1779 (1943)].—The salt acts in neutral solution as a linear high polymer which is rapidly depolymerized when the *p*H is changed to 2·6 or to 11·6. The effect is reversed when the acid and alkaline solutions are neutralized. Both the degraded and the repolymerized nucleic acids have a wider distribution of mol. wt. than the original substance and some of the molecules in the repolymerized portion are larger than those in the original solution.

541.133 : 541.132 *see Abstr.* 293

541.134 : 541.124.7 : 532.739.2 *see Abstr.* 112

541.134 : 621.357 295

Studies on overvoltage. XIII. Decay of cathode potential in still and stirred solutions saturated with hydrogen or with nitrogen. XIV. A study of hydrogen decomposition potentials under various conditions in acid solutions at platinized platinum electrodes. FERGUSON, A. L., AND TOWNS, M. B. *Trans. Electrochem. Soc.*, 82, *pp.* 307–339, 1942.—[See Abstr. 2423 (1943)]. Attention is confined to the natural decay on o.c. of cathode potentials at platinized Pt electrodes. Still and stirred solutions saturated with H or N_2 were used. The object in each case was to produce a condition that would influence the rate of diffusion of active material away from the electrode/solution interface. The influence on cathode charge curves, for platinized Pt cathodes in 2 *N* H_2SO_4, of conditions that alter the H_2 conc. on the solution side of the electrode/electrolyte interface is studied. The cathode potential, both below and above the so-called reversible value, can be materially altered for a given c.d. by conditions on the solution side of the interface which influence the rate of diffusion of H_2 away from or to the interface.

541.134.5 296

A revision of the oxidation potentials of the orthophenanthroline- and dipyridyl-ferrous complexes. HUME, D. N., AND KOLTHOFF, I. M. *J. Amer. Chem. Soc.*, 65, *pp.* 1895–1897, *Oct.*, 1943.—The oxidation potential of ferrous-phenanthroline and of ferrous α,α′-dipyridyl in *M* H_2SO_4 or HCl is 1·06 V instead of the reported 1·14 V.

541.134.5 297

The oxidation potential of the chromocyanide-chromicyanide couple and the polarography of the chromium cyanide complexes. HUME, D. N., AND KOLTHOFF, I. M. *J. Amer. Chem. Soc.*, 65, *pp.* 1897–1901, *Oct.*, 1943.—The reduction of chromicyanide and oxidation of chromocyanide ions at the dropping Hg electrode were studied and found reversible in 1 *M* KCN. The oxidation potential of the chromocyanide–chromicyanide couple was determined both polarographically and by classical means, and found to be − 1·14 V in 1 *M* KCN.

541.135.1 298

The electrolysis of Grignard reagents: short-lived free radicals in ethyl ether. PEARSON, R., AND EVANS, W. V. *Trans. Electrochem. Soc.*, 82, *pp.* 297–305, 1942.—By electrolysing appropriate Grignard reagents it has been possible to study the behaviour of the simple aliphatic and aromatic free radicals at ordinary temperatures and in the presence of a solvent.

541.135.5 299

A reversible oxygen electrode. BERL, W. G.

Trans. Electrochem. Soc., 83, *Prepr. No.* 19, *pp.* 231–248, 1943.—A half-cell was constructed in which gaseous O_2 was in equilibrium with one of its ions. The electrode behaved according to thermodynamic predictions concerning the effect of changes in the activities of reactants and reaction products on the e.m.f. The ion with which O_2 establishes a reversible equilibrium in alkaline solution is HO_2^-. The measured e.m.f. agreed with the value calculated from thermodynamic data for the half-cell reaction $OH^- + HO_2^- \rightleftharpoons O_2 + H_2O + 2e$.

541.144 : 541.634 300

The photochemical dimerization of *trans*-cinnamic acid. BERNSTEIN, H. I., AND QUIMBY, W. C. *J. Amer. Chem. Soc.*, 65, *pp.* 1845–1846, *Oct.*, 1943.—Rapidly precipitated or commercial *trans*-cinnamic acid yielded only β-truxinic acid upon exposure to sunlight. Only α-truxillic acid resulted if the *trans*-cinnamic acid was first recrystallized slowly.

541.147.7 : 771.54 301

Note on the intensity of filtered light sources used in photographic sensitometry. PURSLOW, E. T. *Photogr. J.*, 83, *pp.* 377–380, *Nov.*, 1943.—Attention is drawn to a possible source of error in photographic sensitometry due to the use of a colour temp. of 2 850°K. instead of 2 360°K. Examination of a number of emulsions shows that trouble is only likely to arise in the case of a small class characterized by sensitivity to ultra-violet and far blue light, very much greater than that for longer wavelengths. A. H.

541.18.043 302

Some improvements for the analytical ultracentrifuge. MOORE, D. H. *Rev. Sci. Instrum.*, 14, *pp.* 295–297, *Oct.*, 1943.—Convection boundaries caused by small irregularities in the analytical ultracentrifuge cell [Abstr. 945 (1943)] are described. Accurate alignment of the cell in the rotor may be accomplished by a slot and pin arrangement. An adaptation of Longsworth's scanning method is described.

541.182.046 : 541.127 303

Reaction rates in ionic solutions. DEBYE, P. *Trans. Electrochem. Soc.*, 82, *pp.* 265–272, 1942.—Smoluchowski's method of evaluating the fundamental frequency factor for the rate of a reaction like the coagulation of colloid suspension by employing a purely diffusional treatment is extended to include the electrostatic effects arising from the presence of net charges. The introduction of the concept of a diffuse ionic cloud and the potential calculated therefrom leads to the following results: (*a*) The Brønsted–Debye formula is derived. (*b*) The "solvent" term of the Christiansen–Scatchard equation arising from the self-potential of the ions appears as the linear approximation of an exponential expression.

541.182.5 : 535.434 *see Abstr.* 179

541.182.6 : 531.73 304

Sedimentation volumes and anomalous flow in lyophobic suspensions. GALLAY, W., AND PUDDINGTON, I. E. *Canad. J. Res. B*, 21, *pp.* 172–178, *Sept.*, 1943.—The sedimentation volumes of starch, MgO, Fe_2O_3 and talc in a series of liquids were measured. The results are influenced by the presence of small quantities of water. Increase in sedimentation vol. is related to the deg. of flocculation. Viscosity determinations show that such structures possess rigidity, which is absent in systems showing a small sedimentation volume. The effect of flocculation is particularly large in suspensions of aniso-dimensional particles.

541.182.6 : 535.43 305

Observations on the causes of turbidity in dispersions of cotton and modified cotton in cuprammonium. DAVIDSON, G. F. *J. Textile Inst., Manchr*, 34, *pp. T97–T102, Nov.*, 1943.—The turbidity found in cuprammonium (I) dispersions of cotton that has been boiled with alkali but not extracted with a wax solvent was investigated by separating the material insoluble in (I) contained in powdered hydrocelluloses made from (II) raw, and (III) alkali-boiled cotton, and in the same hydrocelluloses after extraction of wax by $CHCl_3$. The insoluble portion of (II) contained 60% of cotton wax and also a pectic substance (IV). After extraction with $CHCl_3$, (II) gave an insoluble residue free from wax but containing $\sim$0·68% of (IV); whereas the insoluble portion of (III) consisted almost entirely of cotton wax, but after extraction gave only $\sim$0·05% of (IV) which caused only a slight turbidity in a 2% dispersion of (I). N. M. B.

541.182.6 : 537.311.35 *see Abstr.* 202

541.183 306

Sorption and surface area in silica aerogel. KISTLER, S. S., FISCHER, E. A., AND FREEMAN, I. R. *J. Amer. Chem. Soc.*, 65, *pp.* 1909–1919, *Oct.*, 1943.—Sorption data on silica aerogel and xerogel are presented. The area under the sorption curve, when plotted with log p_0/p as abscissa, is a direct measure of the total surface area of the gel. Capillary condensation influences the course of all the curves studied and, in the case of non-aq. liquids on silica gel, may account for nearly all of the sorption measured. Removal of residual water from the surface did not transform the sorption curve to another type.

541.183 : 519.12 *see Abstr.* 22

541.183 : 532.612.4.042 *see Abstr.* 105

541.183 : 535.376 *see Abstr.* 173

541.183.2 : 536.658 : 541.128.34 307

The radioactive exchange and adsorption of methyl bromide with several inorganic bromides. KISTIAKOWSKY, G. B., AND WAZER, J. R. VAN. *J. Amer. Chem. Soc.*, 65, *pp.* 1829–1834, *Oct.*, 1943.—For $AlBr_3$, which is an active catalyst for reactions of methyl bromide, the activation energy for the exchange with methyl bromide is 4·6 kcal. For $BaBr_2$, a less active catalyst, the activation energy is 12 kcal.; and for KBr, which is not a catalyst, the rate of exchange is too slow to detect. The differential heat of adsorption was *ca.* — 3 kcal.

541.183.25 : 536.658 *see Abstr.* 196

541.24 : 532.77 : 532.133 *see Abstr.* 99

541.24 : 661.713 308

Molecular weight of native cellulose. GRALÉN, N., AND SVEDBERG, T. *Nature, Lond.*, 152, *p.* 625, *Nov.* 27, 1943.

541.25 : 536.48 : 548.33 = 3 *see Abstr.* 317

541.25 : 541.64 : 541.132.3 *see Abstr.* 294

541.265 : 532.613.2.08 *see Abstr.* 106

541.45 : 541.128 *see Abstr.* 283

541.57 309

An electron diffraction study of hydrogen peroxide and hydrazine. GIGUÈRE, P. A., AND SCHOMAKER, V. *J. Amer. Chem. Soc.*, 65, *pp.* 2025–2029, *Oct.*, 1943.—[See Abstr. 618 (1942)].

541.57 : 541.124 *see Abstr.* 272

541.571.5 : 539.133 *see Abstr.* 238

541.6 : 548.33 = 3 *see Abstr.* 318

541.634 310

Spectral characteristics and configuration of some stereoisomeric carotenoids including prolycopene and pro-γ-carotene. ZECHMEISTER, L., LEROSEN, A. L., SCHROEDER, W. A., POLGÁR, A., AND PAULING, L. *J. Amer. Chem. Soc.*, 65, *pp.* 1940–1950, *Oct.*, 1943.—The *cis*-peak phenomenon [Abstr. 2914 (1943)] was used for investigation of members of the lycopene stereoisomeric set. No significant contribution to the *cis*-peaks of stereoisomeric mixtures obtained by iodine catalysis or refluxing is made by all-*trans*-lycopene, all-*cis*-lycopene, or prolycopene, whereas some stereoisomers, especially 6-*cis*-lycopene (neolycopene A), show much higher *cis*-peaks than that of the mixture obtained by iodine catalysis. The situation for the stereoisomeric γ-carotene set is analogous. Both prolycopene and pro-γ-carotene undergo stereoisomerization on insolation. A theoretical interpretation is proposed.

541.634 : 541.144 *see Abstr.* 300

541.636 : 535.343-31 *see Abstr.* 161, 162

541.636 : 541.124 *see Abstr.* 273

541.64 : 535.375.5 = 3 *see Abstr.* 168

541.64 : 541.25 : 541.132.3 *see Abstr.* 294

541.651.22 : 535.343 *see Abstr.* 159

541.67 311

The constitution and formula of the dimeric compounds of elements of the 3rd group of the periodic system. EISTERT, B. *Z. phys. Chem. B*, 52, *pp.* 202–208, *Oct.*, 1942.—[See Abstr. 168 (1944)]. A structural formula is proposed in which 3 nuclei participate in a common pair of electrons. The proposal is based on considerations concerning the constitution of B compounds and it is shown why these—contrary to the Al derivatives—are not dimeric. From the electric conductivity properties of Al derivatives, conclusions are drawn on their lattice structure, and comparisons are made with the behaviour of other elements of the 3rd group. R. N.

541.68 : 539.216 312

The reactivity of the cystine linkage in keratin fibres. IV. The action of formaldehyde. V. The action of benzoquinone. STOVES, J. L. *Trans. Faraday Soc.*, 39, *pp.* 294–305, *Nov.*, 1943.—[See Abstr. 956 (1943)]. Load/extension curves of keratin fibres before and after boiling for 1 hr. in 2% HCHO *p*H 2–10 show that at all *p*H values new linkages are formed. The amino groups of a proportion of the salt linkages take part in the reaction. In fibres treated with boiling solutions of 2% HCHO below *p*H 3 or above *p*H 9, linkages are formed which are stable to 1 hr. in boiling 5% $Na_2S_2O_5$. Linkages formed by treatment for 1 hr. with boiling 2% HCHO *p*H 6 confer upon the fibre a partial immunity to attack by oxidizing agents. Changes in the load/extension curves of fibres treated with aq. solutions at the boil, indicate that the reaction gives rise to the formation of new linkages within the fibres, thereby increasing the resistance of keratin to decomposition by hydrolysis and by oxidation.

544.62 : 535.243 *see Abstr.* 143

544.83 : 539.16.08 *see Abstr.* 246

546.17 : 535.343-31 *see Abstr.* 163

546.17 : 539.266 *see Abstr.* 255

546.171 : 535.338.4 *see Abstr.* 153

546.21 : 535.338.42 *see Abstr.* 154

546.212 : 535.343.4 *see Abstr.* 164

546.217 : 536.71(083.5) *see Abstr.* 199

546.262.3 : 541.124.7 : 535.338.42 *see Abstr.* 155

546.264 : 536.631 *see Abstr.* 194

546.264 : 536.633.3 *see Abstr.* 195

546.29 : 538.615 : 535.338.3 *see Abstr.* 152

[546.78 + 546.883] : 536.212.2 : 537.312.6 *see Abstr.* 203

546.86 : 539.163.2 *see Abstr.* 249

[546.883 + 546.78] : 536.212.2 : 537.312.6 *see Abstr.* 203

548.0 : 535.338.42 *see Abstr.* 156

548.0 : 536.4 313

The physical states of anhydrous sodium soaps. GALLAY, W., AND PUDDINGTON, I. E. *Canad. J. Res. B*, 21, *pp.* 202–210, *Oct.*, 1943.—Density measurements and differential cooling curves were carried out on sodium stearate and sodium oleate over a range of temperatures. A large transition was noted at 100°C., due to a melting in a second dimension at rt. angles to the molecular axis. A further large transition was found at 125° to 130°C. leading to a plastic state in the soap; this transition point denotes the essential completion of bidimensional melting of the lattice. At 200°C., disruption of the polar bonds probably occurs to effect complete disruption of the lattice to the liquid crystalline state. Only the latter transition point was found for sodium oleate at 135°C.

548.0 : 536.4 314

The effect of certain addition agents on the physical states of sodium soaps. GALLAY, W., AND PUDDINGTON, I. E. *Canad. J. Res. B*, 21, *pp.* 211–218, *Oct.*, 1943.—The effect of glycerol and of polar and non-polar mineral oils on the density/temperature rel. of sodium stearate and sodium oleate were measured. Up to the unidimensional m.p. of the soap, the polar solvents have no effect. Above this point an increasing effect is obtained both with increase in temperature and with amount of solvent. The orienting effect of the non-polar hydrocarbon chain on the polar grouping of the soap in the presence of a polar solvent is discussed. The influence of excess acid and alkali in the soap is described.

548.0 : 537.226 : 536.21 *see Abstr.* 191

548.0 : 538.662.13 *see Abstr.* 233

548.1 : 512.831 315

The propagation of order in crystal lattices. ASHKIN, J., AND LAMB, W. E., JR. *Phys. Rev.*, 64, *pp.* 159–178, *Sept.* 1 *and* 15, 1943.—Zernike's problem of the propagation of order in a binary crystal alloy

is discussed by means of the matrix formalism. It is proved generally that the existence of long-range order over any temperature range implies a degeneracy of the max. characteristic value of the fundamental matrix over the same temperature range. The absence of long-range order at high temperatures is proved by showing that the max. characteristic value is non-degenerate at sufficiently high temperatures. The problem of propagation of order is generalized by an investigation of the correlation probabilities for more complicated configurations of fixed atoms.

548.24 : 548.55 316

Slip and twinning in single crystals of mercury. FISHER, A., ANDRADE, E. N. DA C. *Nature, Lond.*, 152, *pp.* 567–568, *Nov.* 13, 1943.—[See Abstr. 563 (1935)].

548.33 : 541.25 : 536.48 = 3 317

The mode of low-temperature transformation of ND_4I. SMITS, A., AND TOLLENAAR, D. *Z. phys. Chem. B*, 52, *pp.* 222–229, *Oct.*, 1942.—The low-temperature transformation of ND_4I is compared with that of NH_4I [Abstr. 5187 (1937), 4309 (1938)]. The volume effect is increased by over 6% and the extreme values occur at slightly lower temperatures. The transformation remains continuous. The vol./temp. curve is not only shifted towards lower temperatures but is also steeper. Measurements were checked and abs. mol. vol. values obtained by X-ray spectroscopy. R. N.

548.33 : 541.6 = 3 318

The pseudo-components of the ammonium halides. SMITS, A. *Z. Phys. Chem. B*, 52, *pp.* 230–233, *Oct.*, 1942.—[See Abstr. 317 (1944)]. From thermodynamic considerations, the different kinds of molecules appear to be pseudo-components of a pseudo-system to which the simple substance belongs. Apparently an unmixing process occurs in the mixed crystal range of the pseudo-system and the structure of the pseudo-components must account for the imperfect miscibility in the solid state. So far nothing is known about the structure of the solid phase of these substances. R. N.

548.55 : 548.24 *see Abstr.* 316
549.903 : 537.228.1 *see Abstr.* 201
550.385 : 523.752 *see Abstr.* 41
551.593.5 : 535.436 *see Abstr.* 181
551.593.55 : 525.75 *see Abstr.* 72
551.593.63 : 535.434 *see Abstr.* 180
577.15.02 : 541.128 *see Abstr.* 284
577.16A : 535.371 *see Abstr.* 165
591.12 : 531.733 *see Abstr.* 91
612.8 : 159.1 *see Abstr.* 1
615.78 : 541.126 *see Abstr.* 275
661.713 : 541.24 *see Abstr.* 308
666 : 539.4.016 *see Abstr.* 262
666.1/.2 : 532.13 *see Abstr.* 98
669 : 679.5 : 539.43 *see Abstr.* 266
669.018 : 532.782 *see Abstr.* 114, 115, 116
669.14 : 539.24 *see Abstr.* 253
669.24 : 538.2 = 3 *see Abstr.* 228
677.46 : 539.501 *see Abstr.* 268
678 : 536.758 : 539.31 *see Abstr.* 257
678 : 539.56 *see Abstr.* 269
678 : 620.177 : 539.384 *see Abstr.* 258
678 : 679.5 : 532.694.1 *see Abstr.* 109
678.77 : 536.495 *see Abstr.* 193
679.5 : 539.4.019.1 *see Abstr.* 265
679.5 : 669 : 539.43 *see Abstr.* 266
679.5 : 678 : 532.694.1 *see Abstr.* 109
691.11 : 539.216 : 536.212.3 *see Abstr.* 192
744.345.3 : 531.224.5 : 513.515.6 *see Abstr.* 6
771.54 : 541.147.7 *see Abstr.* 301
778.3 : 539.26 *see Abstr.* 254
78 : 534.321.33 *see Abstr.* 132